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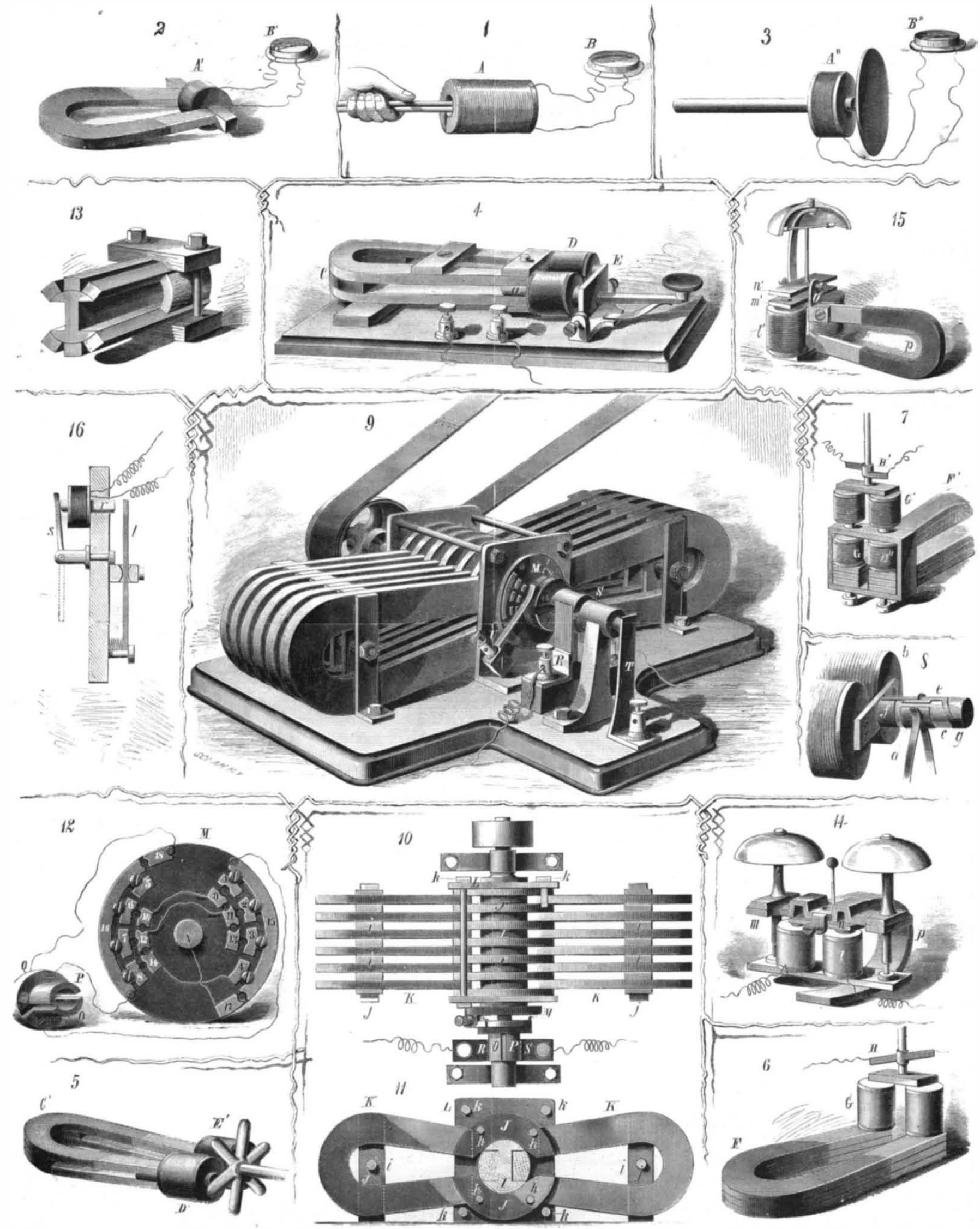

ELECTRICITY BY MAGNETIC INDUCTION—APPARATUS FOR GENERATING AND UTILIZING INDUCTION CURRENTS—[See page 356.]

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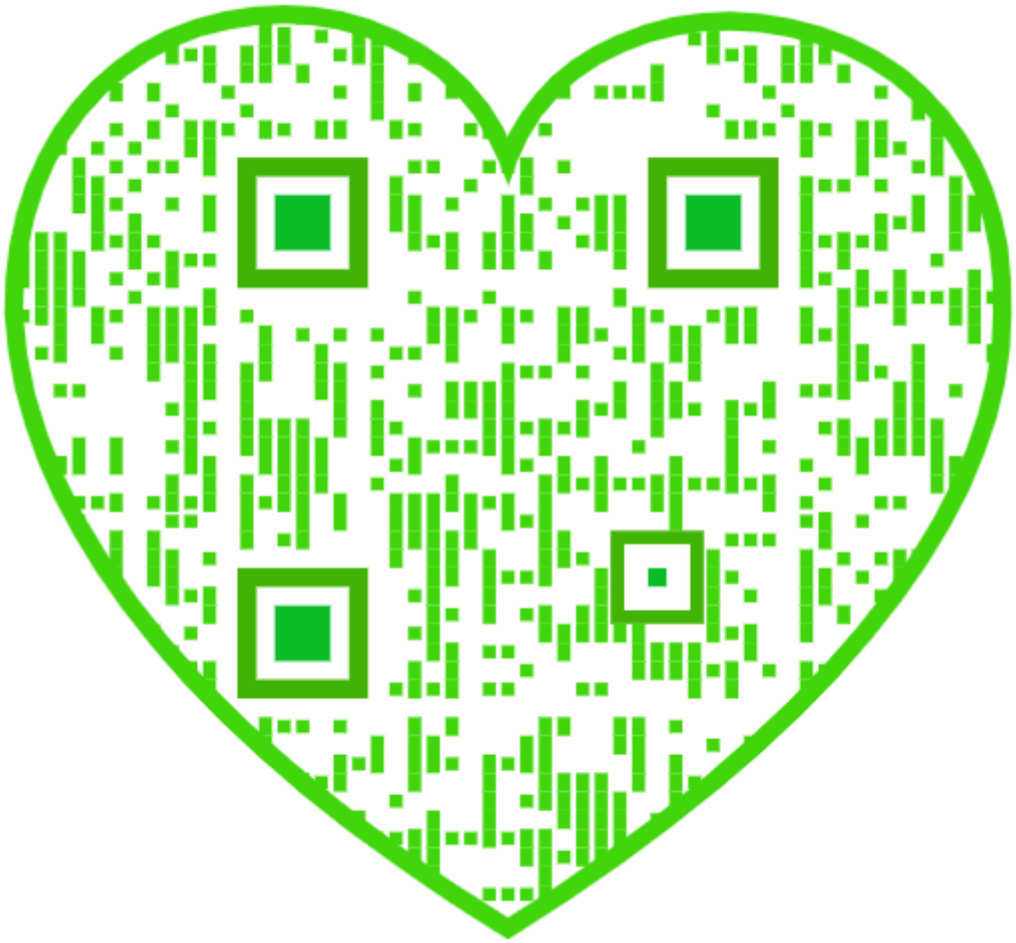

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NEW YORK, SATURDAY, DECEMBER 3, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Academy of Sciences..... 353
Acme, the, of misinstruction.... 352
Agriculture and Manufactures.. 352
Air currents, to diffuse*..... 354
Air, moist, elec. conduct. of 353
Arctic voyage, remarkable..... 359
Benedict, Charles..... 357
Bones, to bleach (2)..... 362
Brass dip. (14)..... 362
Bridge, East River, the..... 358
California enterprise, a..... 360
Candy, sweet flag..... 361
Commander Cheyne's lectures... 352
Congress, electrical, in Paris..... 353
Copper, estimation of, note on... 357
Cotton milling in the South..... 360
Damper, improved*..... 355
Dassori's safeguard..... 360
Destroyer, torpedo boat..... 353
Drumming log, the..... 361
East River Bridge, the..... 358
Electrical conduct. of moist air.. 353
Electrical Congress in Paris..... 353
Electrical steel melting..... 357
Electricity by mag. induct'n* 351, 356
Electric light, secondary bat. (16) 362
Engineering exhibition..... 356
Engineering inventions..... 354
Enterprise, California, a..... 360
Fairbairn grate bar*..... 358
Fish, sun, the great*..... 361
Galvanometer, new..... 354
Gems, North Carolina..... 360
Grate bar, Fairbairn*..... 358
Hobbs, John L..... 357
Hydraulic mining, injunction on 361
Hydraulic rams, air press on.... 354
Inch, an, one million lines to.... 355
Induction currents, app. for*.351, 356
Inventions, engineering..... 354
Inventions, miscellaneous..... 357
Inventions, new..... 359
Inventions, recent..... 355
Jave'le water, to make(3)..... 362
Kid leather, how prepared*..... 354
Leather, kid, how prepared*..... 354
Lectures, Commander Cheyne's. 352
Lock and rever. latch, comb.*.... 355
Locomotive, a, water fuel on..... 352
Misinstruction, the acme of..... 352
Naval and submarine eng..... 356
North Carolina gems 360
One million lines to the inch..... 355
Paper making, Am. suprem..... 353
Paper, ultramarine..... 355
Petroleum, heating tires by..... 354
Pick, improved*..... 354
Point Barrow Signal station..... 358
Rams, hydraulic, air press. on.... 354
Reel and receptacle, ticket*..... 358
Reel, twisting, improved*..... 359
Ruffed grouse, the..... 361
Rust, to prevent, on cutlery(18).. 362
Sciences, Academy of 353
Southern woods, specimens..... 361
Steam boiler notes..... 357
Steel melting, electrical..... 357
Sun fish, the great*..... 361
Sweet flag candy..... 361
Telescope, a great..... 353
Ticket reel and receptacle*..... 358
Tires, heating by petrolum..... 354
Torpedo boat destroyer..... 353
Twisting reel, improved*..... 359
Ultramarine paper..... 355
Water fuel on a locomotive..... 352
Whales cut in two by a steamer. 361
Woods, So. curious specimens... 361

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 309,

For the Week ending December 3, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Compressed Air Engines. By JAS. YOUNG.—5 figures and 8 diagrams.—A critical discussion of the relative economy of compressed air engines, especially for mining uses.. 4926

Siemens' New Gas Generator for Metallurgical Purposes.—2 figures..... 4927

On the Application of Solid Steel to Small Arms, Projectiles, and Ordnance Manufacture. By M. F. GAUTIER.—10 figures.—Schrapnel shell in mould.—Chilled projectile in mould.—Common shell in mould.—Moulding machine, etc..... 4928

Practical Notes on Plumbing. By P. J. DAVIES.—The workshop—in olden times known as the Plumbery.—Sheet lead casting.—Details of processes.—Blown joints.—Wiped joints.—The soil and soiling.—The cloths.—Joint making.—Collars.—Overcasting.—Internal joint wiping, etc.—17 figures 4928

How Silk is Spun from the Cocoon..... 4930

Ship Building a Thousand Years Ago. By COLIN ARCHER, before the Institution of Naval Architects..... 4931

II. ELECTRICITY, LIGHT, ETC.—The International Exhibition of Electricity. By TH. DU MONCEL. Edison's Incandescent Electric Lamps.—Edison's System of Electric Lighting.—The Edison Parlor and Exhibits at the Paris Exhibition. 17 figures..... 4920

Smith's Dynamometer. 1 figure..... 4923

Mègy's Dynamometric Counter. 1 figure..... 4923

The Early Days of Electric Telegraphy and of Ocean Cables. By WILLOUGHBY SMITH..... 4923

Joining Wires for Telegraph Lines, etc. 2 figures..... 4924

III. ANTHROPOLOGY.—Man and Woman. An anthropological comparison of the sexes. By G. DELAUNAY. Physical and physiological characteristics.—Anatomical differences.—Differences in brain volume.—Moral differences.—Intellectual differences.—Male superiority increases with civilization and race development..... 4932

IV. PHYSICAL APPARATUS.—How to Construct a Barometer. By A. F. MILLER. 4 figures, full size, with specific directions for making a barometer..... 4924

V. ART, ETC.—Suggestions in Decorative Art. Monument by Dietelbach, Stuttgart..... 4932

VI. CHEMISTRY, ETC.—Corrosion of Platinum..... 4931

THE ACME OF MISINSTRUCTION.

The public schools of Philadelphia—some of them at least—have achieved the unenviable fame of having "about the vilest plan of education that was ever devised." So at least an indignant parent says, and the proof offered is, we trust, sufficient. We cannot bring ourselves to think that any school work can be worse.

Hearing his little girl sobbing over a rule which she was trying to commit to memory, he investigated the matter and found the words to run in this wise:

"Rule for Short Division Rule dash one write the divisor at the left of the dividend, semicolon, begin at the left hand, comma, and divide the number denoted by each figure of the dividend by the divisor, comma, and write the quotient beneath, period. Paragraph."

"2. If there is a remainder after any division comma, regard it as prefixed to the next figure comma and divide as before period. If any partial dividend is less than the divisor, comma, prefix it to the next figure, comma, and write a cipher in the quotient period."

"Paragraph Proof period dash multiply the quotient by the divisor, comma, and add the remainder, comma, if any, comma, to the product, period."

The teacher's object was not to reduce this particular ten-year old girl to idiocy or insanity by the quickest possible method; the aim was simply to insure the "correct" writing and pointing of the rule in the recitation room. All the children had to study rules that way; and though a Philadelphia lawyer could not easily follow the sense of a rule through such a jargon of words, it seems that Philadelphia children are compelled to; or, rather, they are compelled to memorize the jargon and the sense is disregarded. In the course of his inquiries the parent found that if a comma was left out in writing the rule, though the sense remained unchanged, the pupil suffered as much in loss of marks as though she had committed a vital blunder.

A more thoroughly foolish perversion of arithmetical instruction could not well be conceived. And the professional stupidity and formalism which could devise such an outrageous method of teaching one subject is from that achievement alone demonstrably unfit to be trusted with any branch or department of instruction.

Taking the schools as they run, good, bad, and indifferent together, it is speaking within bounds to say that two-thirds of the work done in them might be wiped out and abolished to the benefit of the children. They might then have time to learn in a reasonable way some things worth their while to know, in the learning of which in a proper way they would be educated and not stultified, as they are under the more or less mitigated Philadelphia fashion now prevalent.

WATER FUEL ON A LOCOMOTIVE.

We learn from the *Tribune* and other papers that a locomotive in which neither wood nor coal will be burned is now in process of construction at the Grant Locomotive Works at Paterson, N. J. "In reality the fuel to be used is water," says the *Tribune*, and several of the other papers introduce their notices of the locomotive with the announcement, "The use of water as fuel." All this, coming in the dry season, is certainly very startling. But really no alarm need be felt about our Croton supply and our very useful rivers, for it is not exactly the water which is to be set on fire, but, as the *Tribune* explains, the water is first "decomposed in association with carbon, forming readily combustible gases, of which hydrogen is the chief." We are further relieved on learning that the project is in fact only the naphtha water vapor process which was about ten years ago fully tested at the Brooklyn Navy Yard, on the Battery, and elsewhere.

The explanation of former failures appears now to be that the older experimenters did not have the correct theory. The *Tribune* says: "The argument brought against the Holland," (naphtha steam) "process was that it was based on an erroneous principle, being in opposition to the law of conservation of energy. But it is answered that while the dissociation of steam must require as much energy as is later developed in the combustion of the hydrogen, that energy need not necessarily take the form of heat in the dissociation process. The form of energy which does take the place of the heat saved is stated to be chemical affinity." "The carbon of the naphtha gas, with which steam is brought in direct contact in the Holland process, lowers the dissociation temperature to 400° C. As the hydrogen resulting from the dissociation burns with a heat of nearly 8,000° C., a gain is effected, roughly speaking, of nineteen-twentieths of the whole heat."

The sentences quoted seem to be intended to represent that some new principle has been discovered relating to the decomposition of water, and that the Holland process effects a saving of nineteen-twentieths of the cost of heat by former processes. But there is nothing alluded to as of a scientific character which has not been familiar knowledge for a long time. As to the saving of heat it should be noticed that the nineteen-twentieths, roughly speaking, is only one side of the cost account. Admitting that nineteen-twentieths of the heat required to dissociate the elements of water would be "saved" when the elements were separated by an equivalent of chemical affinity, no advantage could be shown until it appeared that chemical affinity was cheaper than heat. Water at a freezing temperature may be decomposed by sodium or electricity, and the whole of the heat of dissociation be "saved;" in like manner the cost of going by the lightning express may be "saved" by taking the owl train. The accuracy of the figures, nineteen-twentieths, is not material to the argument, and it is not worth while to expose the fallacy of the calculation which has produced them.

The Holland apparatus, as described, seems to us somewhat crude in comparison with some others of a similar intent. He uses naphtha and water vapor under materially the same conditions as his predecessors, and even if he had discovered a new theory it is not likely that naphtha steam would behave differently on that account.

The most that can be reasonably hoped from the experiment is that it may result in some useful hint on the use of naphtha fuel in places where it is more needed than on a locomotive.

COMMANDER CHEYNE'S LECTURES.

The first of a series of lectures on Arctic Research was delivered in this city, November 17, by Commander Cheyne, of the British Navy. The lecture was illustrated by a series of beautifully colored vivid and spirited stereopticon pictures of Arctic scenes and incidents, in several of which certain of the objects were represented in motion while the general scene was at rest.

In substance, delivery, and illustration, the lecture was a notable and admirable innovation upon the usual custom in such cases. Though an old man Commander Cheyne retains much of the dash and vigor which he displayed years ago in the search for Sir John Franklin. His purpose in these lectures is to enlist the co-operation of our people in an expedition to the Pole, in which balloons are to be employed after reaching the coal deposits on Smith's Sound, 500 miles in a direct line from the Pole.

As our readers will remember, the plan of employing balloons in Arctic research, as proposed by Commander Cheyne, was described and illustrated in this paper two years ago (September 20, 1879).

THE RELATION OF AGRICULTURE AND MANUFACTURES TO POPULATION.

The Census Office has issued a bulletin presenting the results of a study of the statistics relative to the distribution and density of population last year, in comparison with the result of previous enumerations.

The settled area is taken to include all which contains a population of two or more to the square mile. Upon this definition the settled area of 1880 is mainly comprised in one large body lying eastward of the plains. Here reside 95 per cent of the total population of the country, the remainder being in detached bodies of comparatively small size, chiefly in Oregon and California.

Within the great settled area are several regions practically unsettled, like Southern Florida, the northern part of Maine, the Adirondack region in Northern New York, and Northern Wisconsin and Minnesota. Five grades of density are recognized, three of them denoting the predominance of agricultural pursuits. The first grade represents a sparse population—from 2 to 6 to the square mile. It is found mainly along the frontier, in Florida, Minnesota, Nebraska, Kansas, Texas, California, Colorado, Oregon, and the Territories. In these areas the population is sustained rather by the grazing industry than by agriculture. In some parts mining is obviously an industrial factor. The poorest tillage regions sink into this grade, which is not inconsiderably represented in some of the older States.

The second grade of population—6 to 18 to the square mile—indicates for the most part defined farms and plantations, and the systematic cultivation of the ground; but this, either in an early stage of settlement or upon more or less rugged soil. This grade is found largely in many of the Western and Southwestern States, and in the mountainous regions of the Atlantic slope.

The third grade—18 to 45 to the square mile—almost universally indicates a highly successful agriculture. Here and there the presence of petty mechanical industries raises a difficult farming or planting region into this grade of density of population, but in general, where manufactures exist at all, they induce a population of 45 or more to the square mile. Speaking broadly, agriculture in the United States is not carried to such a point as to afford employment and support to population in excess of that number. This third grade of population is predominant in Alabama, Delaware, Georgia, Illinois, Iowa, Kentucky, Maryland, Mississippi, Missouri, North and South Carolina, Tennessee, Virginia, and Wisconsin. Of the New England states, Maine, New Hampshire, and Vermont have also large tracts in this degree of settlement.

The fourth grade of settlement—45 to 90 to the square mile—almost universally indicates the existence of commercial and manufacturing industry and the multiplication of professional and personal services. This grade is found in excess of any other in Connecticut, Indiana, Maryland, Massachusetts, Michigan, New York, Ohio, and Pennsylvania.

The fifth grade—90 or more to the square mile—represents a very advanced condition of industry. In New Jersey and Rhode Island alone is this grade of settlement in excess of every other grade, indeed in excess of the sum of all the other grades. This degree of settlement is reached only where manufacturing and trading villages are numerous.

The States containing more than a thousand square miles in the fourth grade of settlement are Illinois, 13,500 square miles; Indiana, 24,810; Iowa, 1,100; Kentucky, 11,000; Maine, 2,795; Maryland, 6,860; Massachusetts, 4,840; Michigan, 16,630; Mississippi, 2,200; Missouri, 1,160; New Hampshire, 1,230; New Jersey, 2,440; New York, 33,000; North Carolina, 4,700; Ohio, 37,600; Pennsylvania, 20

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South Carolina, 2,300; Tennessee, 10,200; Virginia, 7,000; West Virginia. 3,645; Wisconsin, 6,900.

The States containing over a hundred miles in the fifth grade of settlement are Connecticut, 780; Illinois, 700; Kentucky, 600; Massachusetts, 2,900; New Jersey, 3,065; New York, 2,420; Ohio, 2,060; Pennsylvania, 10,750; Rhode Island, 685; Wisconsin, 450.

The distribution of population throughout the entire settled area of 1,569,570 square miles, is:

Grade I.	(2 to 6 to sq. m.)	384,820 sq. m.
" II.	(6 to 18 ")	373,890 "
" III.	(18 to 45 ")	554,300 "
" IV.	(45 to 90 ")	232,010 "
" V.	(90 and over ")	24,550 "

The practically unsettled area of the United States, exclusive of lakes and river surfaces bounding the republic or the single States, is 1,456,924 square miles.

THE NATIONAL ACADEMY OF SCIENCE.

The fall meeting of the National Academy of Science, at Philadelphia, beginning Nov. 15, called together as usual a representative body of working scientists. In response to the request of the United States Commission, appointed to take charge of the observation of the Transit of Venus next year, the Academy appointed as a committee to co-operate with the commission: Professor C. H. F. Peters, of Litchfield Observatory, Clinton, N. Y.; Professor S. P. Langley, of the Allegheny Observatory, Pittsburg; Professor E. C. Pickering, of Harvard College Observatory; Professor C. A. Young, of Princeton College; Professor H. A. Newton, of Yale College; and Professor Henry Draper, of New York.

Among the papers of the earlier sessions were three by Professor Agassiz—on "A Gigantic Salpa found in the Gulf Stream;" "The Echini of the Challenger Expedition;" and "The Distribution of Corals on the Tortugas;" and two by Professor Marsh—on "Classification of the Dinosauria," and "Succession in Time of the Allotheria."

A very interesting account was given by Professor Morse of changes and variations in the forms of recent shells. Professor Langley spoke of the late expedition to Mount Whitney and the solar observations made there. Professor A. C. Young described "A Form of Regulator for the Driving-Clock of an Equatorial." Professor Silliman read a paper on a "Remarkable Mineral Vein in the Black Mountains of New Mexico." The life and services to science of the late S. S. Haldeman were considered by Professor Lesley. Professor Peirce read a paper on "The Logic of Numbers," contrasting the logical methods of logicians and mathematicians. President Morton described the preparation of a chemical substitute for quinine. Professor Newcomb's paper on the "Velocity of Light" was read by the secretary, the author's duties in Washington preventing his attendance.

The last day of the meeting Professor Silliman presented a paper prepared by Peter Collier, Ph.D., chemist in the United States Department of Agriculture, giving some important facts regarding sorghum, and conclusions as to its value as a source of sugar; Professor Wolcott Gibbs a paper upon "The Theory of the Dynamo-Electric Machine." Professor Barker followed with a paper on "Mascart's Electrometer and its Use as a Meteorological Instrument." The speaker suggested the great benefits to be obtained from an international communication among signal service bureaus. The subject was also discussed by Professor Abbey, of the United States Signal Service; Professor Langley, of Pittsburg, and Professor Rowland, of Baltimore. Professor Silliman offered a resolution, "That the subject of sorghum sugar is, in the opinion of the Academy, of sufficient importance to be referred to a committee of chemists, with the request that they give Dr. Collier's results and methods a careful consideration, and report at their early convenience the conclusions to which they come." The resolution was referred to the Council of the Academy. Professor E. D. Cope, of this city, closed the session with a paper on "The Fossil and Recent Fauna of the Oregon Desert."

The Electrical Congress at Paris.

All the proceedings of the Congress, says *Nature*, have been conducted in French, and it was a novel sensation to most of us to see our English friends mount the tribune and deliver their sentiments in French; a still more novel sensation to those who for the first time ventured upon such an undertaking themselves. You first rise in your place and say, *Je demande la parole*, at the same time holding up your hand to catch the eye of the president. On his replying, *Vous avez la parole*, you walk from your place to the tribune, which is a raised platform in front of the audience, and there, with the eyes of the assembled *savants* of Europe fixed upon you, you must carry out your rash undertaking, with all your imperfections on your head. It is like the sensation of diving for the first time into deep water, where you must swim or drown.

In these international gatherings very wide deviations from the correct standards of grammar and pronunciation are indulgently tolerated, and the English have certainly not appeared to disadvantage as compared with the Germans; though it has been by no means a rare occurrence to see a speaker of either of these nations in sore straits for want of a word. There is one great advantage in conducting a congress in a foreign tongue, and that is that the difficulty of the situation puts a wholesome check upon any tendency to verbiage on the part of a speaker; he is glad to express his meaning in the simplest manner that he can, and to desist as soon as his laborious task is accomplished; but this advantage is to some extent lost where, as on the present occasion, the language is the native tongue of half the members of the Congress. Some of the later sittings were decidedly dull and unprofitable, being mainly occupied with prolix dissertations of no general interest. The *Salle des Séances*, with its draped walls and high canvas roof, is very stifling to the voice, and much of what was said was insufficiently heard by the bulk of the audience.

The official reports of the proceedings were taken not by shorthand writers, but by young men skilled in science, who wrote abstracts of the speeches in longhand during their delivery; and it must be acknowledged that they did their work exceedingly well. The report thus taken of each meeting was printed and laid before the members at the next meeting, to be adopted before proceeding to any other business. It is called the *procès verbal*, and is treated like the minutes of an English meeting, but it is much fuller than our minutes usually are.

The Torpedo Boat Destroyer.

The first public exhibition of Captain Ericsson's torpedo boat Destroyer was made at Hoboken, November 14. Several prominent officers of the army and navy were present. The chief object of the exhibition was to demonstrate the practical working of the submerged gun by which the torpedo missile is sent upon its deadly errand; also to show the ability of the torpedo to penetrate protective network around a fleet or a single ironclad.

A dummy projectile was used—that is, one of wood without a torpedo charge. In the test the dummy was discharged from the cannon by use of 12 pounds of giant powder at a target net of manila rope and wooden slats 300 feet distant. The muzzle was 6 feet and 6 inches below the surface, and the projectile passed through the target 5 feet under water, and appeared on the surface 100 feet further in-shore, and rode on the water at a considerable speed for 200 feet more, making a distance of 600 feet traveled in all. The projectile, which was 25 feet 6 inches in length, traveled through the water to the point of appearance on the surface, 400 feet, in three seconds, and this with a charge of but 12 pounds of powder. The gun is fired by electricity by the wheelsman, who, through his lookout, must aim and discharge the gun in accordance with his best judgment as to effectiveness. The experiment, which was under the direction of V. F. Lassoe, was pronounced a success by all who witnessed it. It was the fifty-second time the gun has fired the projectile, and at no trial since the boat has been put in working order has it failed with the same charge to throw the dummy torpedo 300 feet in three seconds or less. The French officers were especially interested in the experiment, and though they at first pronounced it an impossibility to operate a gun constructed on such principles and with submerged muzzle, successfully, as many engineers have done before them, they were obliged to acknowledge that the theory had proved correct. Astonishment was depicted in every line of their countenances when they saw the projectile rise to the surface beyond the target after having traversed the distance from the muzzle of the gun and through the netting without making even the faintest ripple on the surface.

In actual service the torpedo projectile is to carry 340 pounds of dynamite—enough to destroy the largest ironclad. The gun will be discharged with a force sufficient to carry the projectile from 300 to 700 feet through the water.

Full details as to the construction and armament of the Destroyer, with engraved illustrations, will be found in recent volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT.

American Supremacy in Paper Making.

Recent estimates concerning the number and distribution of the paper mills in the principal countries of the world show that the supremacy of the United States as a paper-making country is remarkable. The number of mills in the United States is set down as 960; in the United Kingdom, 650; in Germany, 543; in France, 539; in Italy, 206; in Austria, 160; in Russia, 160; in Spain, 63; in Portugal, 16; in Belgium, 29; in Holland, 16; in Denmark, 19; in Switzerland, 15; in Japan, 6; in Greece, 1; in Roumania, 1; in Cuba, 1.

These figures, of course, are not in some cases exact, but they approximate to correctness sufficiently for all practical purposes. The total number of these mills, exclusive of those in the United States, is 2,425, or only about two and a half times as many mills as there are in this country. When we consider the great populations of European countries, and the high degree of civilization that has long prevailed in most of them, it is surprising that this country, settled recently—comparatively speaking—by civilized races, should have so rapidly stolen the march on older nations in the development of the paper industry. Interesting in this connection are the following figures, illustrating the rapidity of the growth of paper making in the United States in comparison with its development in Russia.

In 1801 there were 26 paper mills in Russia; now there are 160, an increase of 134. In 1854 there were 750 paper mills in the United States; now there are at least 960, an increase of 210. The latter number, in comparison with 134, makes a pretty good showing, in view of the fact that the large increase in the United States took place in about one-third of the time required for the above mentioned increase in Russia.

Rapid as has been the advancement of paper making in this country in the past, its development in the immediate future promises to be no less noticeable. In common with other branches of business, paper making is now enjoying much prosperity. During last year the improvement in the trade was very marked, it being conceded that 1880 was the best year since 1865. Paper makers were not largely at the mercy of buyers, as for some time previously they had been, and were enabled to speedily raise their business to a footing much more favorable to themselves. The present year has so far been eminently satisfactory, and the future is full of encouragement. Many new mills have been erected during the past few months, and the day is very near when there will be a round dozen hundred in the country. Not only will there be an increased demand for paper in the ordinary channels in which it is used, but the many new ways of utilizing this material, which are coming into vogue, will render important aid in swelling the volume of production. If, in addition, energetic efforts are made to increase our export trade with South America, Australia, and other foreign markets, the continued prosperity of the paper industry in the United States would seem to be thoroughly assured—*Paper World.*

Another Horse Distemper.

A new and rather serious distemper has been prevailing among the horses in this city. It appeared in the latter part of October, coming from the West, and spread rapidly. Work horses have suffered more than carriage horses; those of certain street car lines most severely. At this writing nearly a quarter of the horses of the Fourth Avenue company are in hospital. The new horses brought in from the country to replace those lost at the late burning of the company's stables were the first to be prostrated, and their symptoms are more severe than in horses accustomed to the work and the climate.

Dr. Samuel Whelpley, the surgeon in charge of the Fourth Avenue horses, describes the symptoms as follows:

The eyes matterate, the nose discharges profusely, the legs swell to abnormal proportions, and every organ appears to be affected. Unless treated in time it will develop into pneumonia. It is very debilitating, and renders the animal attacked so weak that it can hardly stand. Dr. Whelpley said that he heard no name applied to it, but he regarded it as a form of typhoid pneumonia. Horses have died within 16 hours after exhibiting the first symptoms. Some animals recover in a few days, and others not in weeks. In their stalls the horses stand in a position to favor their weakening condition and keep their heads down. They eat very little and apparently have no appetite. Frequently cases are attended with coughing and strangling. The only remedy for the disease appears to be relief from work, good care, and the free use of stimulants and tonics. If taken in time, veterinary surgeons say, no case need prove fatal, but owners and drivers do not generally know the serious consequences, and so neglect the animals too long.

Electric Conductivity of Moist Air.

Some electricians have held that humid air acts as a conductor of electricity; and others, notably the Count du Moncel and M. Gaugain, have maintained that it does not. Recent experiments of M. Marangoni support the latter theory very decidedly, for he finds that a Leyden jar heated so as to prevent condensation of moisture on its glass walls and thus arrest surface conduction, gives a long spark as in the driest air. When, however, the precaution of heating the walls of the jar is not taken, the moisture condenses on the latter, and forming a thin film of water, causes a silent discharge which might be mistaken for a slow discharge through the conducting air. It follows from these experiments that the loss of electricity on telegraph lines is wholly due to surface conduction over the wet and dirty insulators or leakage along entangled threads and branches of trees at particular points, and not to a general discharge into the saturated air.

A Great Telescope.

The observatory in the neighborhood of Nice, which is being erected at the expense of M. Bischoffsheim, is rapidly approaching completion. The great equatorial telescope is to be one of the largest in the world—perhaps the largest—as it will have an object glass three feet in diameter and a focal length of upwards of fifty feet. The construction of this monster telescope has been intrusted to MM. Paul and Prosper Henry, of Paris, and the total cost of the observatory will be more than $400,000 in American money.

The Seventh Comet of 1881.

On the night of November 16, Director Lewis Swift, of the Warner Observatory, discovered the seventh comet of the year in the constellation of Cassiopeia, in a line between Polaris and the great cluster in Perseus, a trifle nearer Polaris. It is nearly round, faint, and has a slight central condensation, but no tail is yet visible. Its right ascension is 1 hour and 50 minutes; declination north. 71°, and its motion slowly westward. Its estimated diameter is about 4 minutes. As the comet of 1812 is anticipated from this quarter, it may be the great Pous comet. This makes the sixth comet discovered in this country since May 1.

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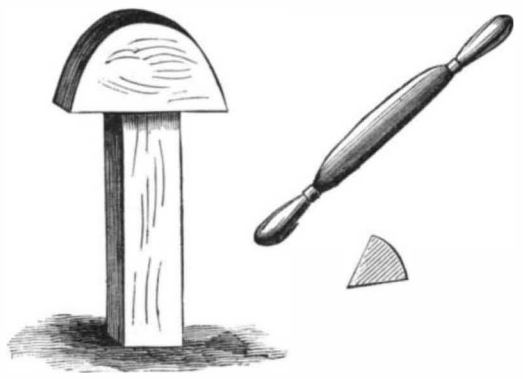
HOW KID LEATHER IS PREPARED.

The skins usually employed are those of the sheep, lamb, and young goat.

The skins are first cleansed by immersing them in running water for several hours (or for two days, if dry), after which they are "broken on the beam"—that is, softened and made flexible by rubbing them on the flesh side with the back of the flesh knife while spread over the "beam" (Fig. 1). Next they are hung up singly in a drying room to dry as quickly as possible, otherwise they are apt to putrefy and get spotted and tender.

The flesh side of each skin is then smeared over with cold milk of lime, prepared by agitating about twelve ounces of good lime in a gallon of water. The limed skins, placed



Beam or Stake. Flesh Knife.

back to back in pairs, are stacked thus in piles for several days, or until the hair *gives* readily, after which they are well rinsed in running water and *fleeced*. The fleecing operation consists in plucking out the hair or wool with spring tweezers and smoothing the hair side with a whetstone or rolling pin.

After fleecing the skins are rinsed, (usually) put into lime water for several hours, and then immersed in an old or weak lime water bath for about two weeks. While in this *hardening bath* they are frequently *handled*—that is, taken out, drained, and put back again.

The next operation is that of "branning," in which they undergo a steeping for several days in a fermenting mixture composed of—

Bran	2 gallons.
Water (soft)	1 gallon.

As soon as the skins sink in the liquor they are considered sufficiently *raised*, and should then be removed. The *raising* requires usually about two days in summer and four days in winter.

Next the skin goes to the *white bath*, the composition of which for one hundred skins may be—

Alum	10 pounds.
Water	12 gallons.
Salt	2½ pounds.

The proportion of salt used is increased to about three pounds in winter.

In this bath, heated to boiling, the skins are passed separately and then transferred to it in bulk for about ten minutes, when they are removed and the bath allowed to cool somewhat.

To this alum bath is then added fifteen pounds of wheat flour and afterward the yolks of about fifty eggs, and the mixture is stirred to form a smooth paste.

The skins are passed singly through this paste, then transferred to it in bulk, and allowed to remain therein for twenty-four hours or more.

This treatment makes the skins soft, whitens them, and counteracts the tendency to brittleness after exposure to air.

After this softening operation the skins are stretched upon poles in a drying loft and left there for about ten days. Next they are moistened with water, stretched, and ironed, then spread upon the beam with a clean undressed skin underneath, and worked over with the back of the fleshing knife. The finer skins are usually rubbed down with fine pumice stone powder and finished with a warm flat iron.

In some large factories the skins are put into a churn or roundabout with the alum bath and other tanning materials.

The skins, after dressing, are stretched on a tin or zinc table and receive the color (if not to remain white) from a rubbing brush, after which the surface is pumiced down, partly dried on a frame, and again stretched on the table to receive more color. These coloring, smoothing, stretching, and drying operations are often repeated three times to insure a *full* color. The skins are finally dried on hooks in dry lofts, where they can be suspended so as not to touch one another, and finally ironed.

ENGINEERING INVENTIONS.

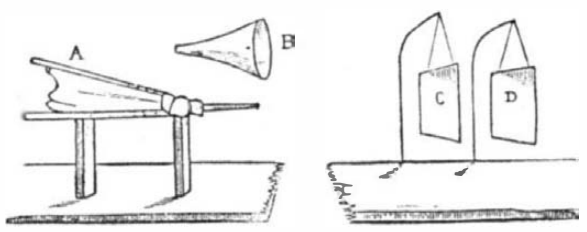
Mr. Samuel H. Terry, of Guthrie, Mo., has patented certain improvements in traction rope railways. These improvements relate to railways in which the cars are driven by a traction rope moving in a tunnel or gutter placed below the ground. The invention consists in a combination of a gutter or tunnel having its upper side closed by a cover arranged in short hinged sections, a moving traction rope within the gutter, and a car or cars provided with devices for clutching the rope and opening the sections of the gutter cover as the car passes on the track. It also consists in a gutter for the traction rope having apertures in its bottom and provided with water-ways beneath the bottom and under the cross ties, for the purpose of allowing water to pass off readily and permitting flushing to remove refuse, likewise compound hinged covering plates for traction rope gutters intersecting one another, pivoted double ended bars fitted to hold down the rope and for movement by a clutch of a passing car, means for directing and supporting intersecting traction ropes, and other devices for insuring improved efficiency generally. By the invention the difficulties experienced in operating traction rope railways at crossings and those arising from an open gutter are obviated.

An improved car coupling, which does away with the necessity of going between the cars to connect or disconnect them, but which admits of the ordinary coupling bolts or pins being used, has been patented by Mr. Franklin W. Haulenbeek, of Sedalia, Mo. The invention comprises a cranked rod arranged upon the end of the car above the drawhead, and having attached means for turning it from the top or sides of the car. The coupling bolt is connected by a link with the cranked portion of the rod, the turning of which raises or lowers the bolt. Said cranked rod has also attached to it a swinging guide for directing the connecting link into the drawhead, or for supporting it when entering the drawhead of an approaching car.

How to Diffuse Air Currents.

An interesting experimental apparatus, to illustrate the best mode of diffusing air currents, when introduced into apartments for ventilation purposes, was shown at the late London Sanitary Exhibition at South Kensington.

A is a pair of ordinary domestic bellows supported on uprights at the end of a base board, measuring about four feet in length; C D, a pair of suspended plates, against which the air from the bellows is directed. When the air issues from

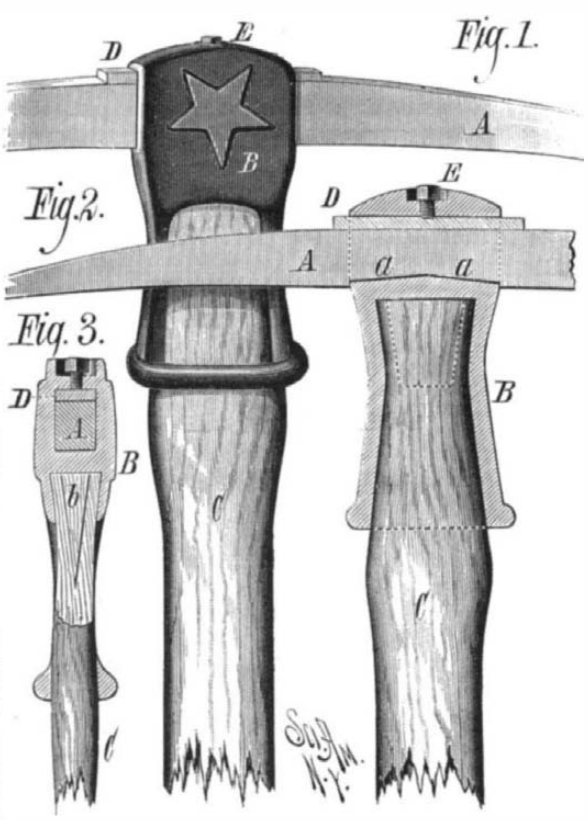


the ordinary nozzle, the plates, C D, will be violently agitated; but if the conical nozzle, B, is now applied to the bellows nozzle, the issuing air will be at once diffused and the plates, C D, will remain at rest. This experiment indicates that when cold or other air is to be delivered into an apartment the delivering orifice should be of conical form.

IMPROVED PICK.

The engraving shows an improved pick and socket head recently patented by Mr. Joseph C. Cramer, of Leadville, Col. It is made so that the pick may be readily removed from its socket and quickly replaced, so that it will always be properly balanced.

The pick, A, may be of any desired form or material, but its central portion is of such size as to fit into the socket head, B; and it is provided with a double inclined seat in the middle on the underside to fit over a support of corresponding shape in the socket head. The pick is firmly secured in place by the wedge, D, which in turn is retained by the set screw, E.



CRAMER'S IMPROVED PICK.

The handle, C, is received by a skeleton socket, and is secured therein by a wedge, which is inserted into the end of the handle before the handle is driven into the socket.

This makes a complete and durable method of attaching picks and handles. It admits of removing the pick from the handle for repairs, and also admits of the interchange of different kinds of picks in the same handle.

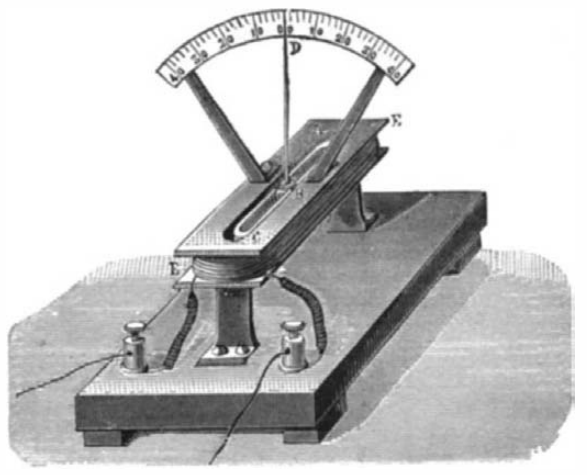
Fig. 1 shows the socket handle complete. Fig. 2 is a longitudinal section, showing the internal form of the socket head; and Fig. 3 shows the manner in which the wedge is introduced.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.

NEW GALVANOMETER.

Horseshoe magnets are stronger and more permanent than bar magnets on account of the proximity of the two poles, and they are more powerfully affected by the current.

These considerations led M. Deprez to employ them in a



M. DEPREZ'S NEW GALVANOMETER.

galvanometer, but on account of their form he was obliged to modify the galvanometer bobbin.

The accompanying engraving represents the arrangement adopted.

In the interior of the bobbin, E E, there are two small horseshoe magnets, A B, B C, exactly alike, and joined together at B, with similar poles opposed to each other. Each magnet may be regarded as an aggregation of an infinite number of very small bar magnets, parallel to the line upon which the horseshoe magnets are joined. When the wire of the bobbin is traversed by the current these imaginary bar magnets tend to assume a position perpendicular to the plane of the bobbin.

The advantages which result from this mode of construction are:

1. A more energetic action than that which would be developed by a bar magnet of the same weight and construction as the two horseshoe magnets.

2. The inertia is very much reduced, and consequently the rapidity of the indications is greater.

3. It admits of greater inclination than the bar magnet without removing it from the influence of the bobbin.

This system suspended vertically by a filament of silk constitutes an apparatus superior in sensitiveness and rapidity to the ordinary galvanometer. It is easy to render it astatic, and its magnets may be made of sewing needles.

Correspondence.

Effect of Varying Air Pressure on Hydraulic Rams.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of October 22, 1881, an article by Mr. Baldwin Latham appeared on the "Influence of the Weight of the Air on the Flow of Springs," and as the subject had some analogy to one in which the writer had made similar observations it was read with very great interest. We allude to the working of a hydraulic ram under variations of atmospheric pressure. The variation of the stream thrown by a ram was first observed, and why the variation should exist was then made the subject of observation. It was demonstrated that in damp or cloudy weather a full unbroken stream was ejected, while in fair, clear days the stream was full of air bubbles and unsteady in its working. This led to observing the change daily, and the variations could be told twenty four hours ahead with unvarying certainty. Thus any one who has a hydraulic ram has a miniature signal service of his own, and can predict the state of the weather twenty-four hours ahead by observing its workings.

YPSILANTI.

Heating Tires by Petroleum.

To the Editor of the Scientific American:

In your paper of November 5, question three, by W. A., says: "I am in business here, and am under considerable difficulty regarding the best mode of heating tires for carts and other wheels."

Now I would say that here is a new field for inventors to employ their genius, as I know that crude petroleum of the value of two or three cents will supply sufficient heat for the purpose of heating one large tire in ten minutes—that is to say, should an apparatus be properly constructed of cast iron.

OLD MECHANIC.

P.S.—No inventor should experiment with a tire heater unless he is the possessor of two hundred dollars, which he can easily part with for that purpose.

Boston, November.

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COMBINED LOCK AND REVERSIBLE LATCH.

The engraving shows an improved reversible lock of simple and novel construction, adapted to a wide field of combinations and changes. It is small and compact in form, and arranged by a peculiar method of operation to be practically non-pickable.

Fig. 1 is a plan view with the top plate or cover taken off. Fig. 2 is a plan view, with the tumblers, wards, and the slotted or toothed plates removed. Fig. 3 shows the tumblers and wards.

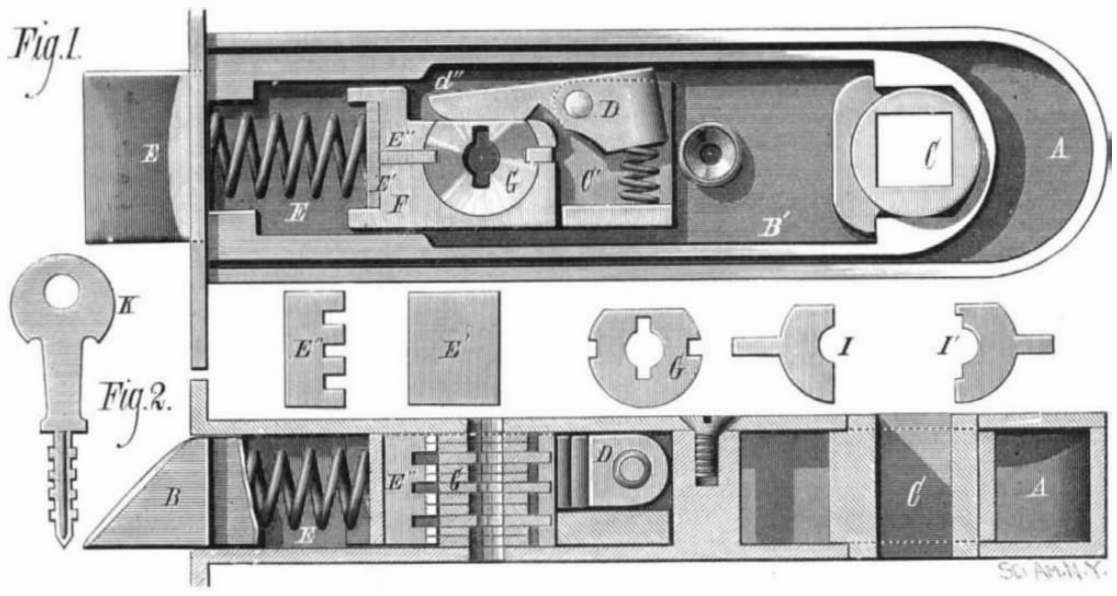
The case or frame, A, in which the lock mechanism is inclosed, is provided with a removable top or plate. The door bolt, B, serves the twofold purpose of bolt and door latch, its yoke-shaped shank, B′, extending beyond the hub, C, through which the knob spindle passes, and having its inner walls provided with projecting abutments, with which lugs, formed on the hub, C, engage, operating, when the hub is turned, to reciprocate the door bolt, B, and lock or unlock the door.

A spring-pressed dog bolt, D, is secured by pivot to a block, C′, attached to the bottom plate of the case frame, the dog bolt being operated by the rotating tumblers to engage the abutment, d'', situated in the forward portion of the yoke shank, and lock the door bolt, each of the rotating tumblers being provided with a cam face, which, when simultaneously presented to the lower face of the dog bolt, will allow it to drop and release its engagement with abutment, d'', and unlock the door bolt. A spiral spring presses the toe or point of the dog bolt down upon the tumblers. A spiral spring, interposed between the rear face of the door bolt and a thin bearing plate held between two flanges formed in the forward portion of the socket block, F, has the twofold function of throwing the locking bolt forward when it has been withdrawn, and of holding the toothed plate, E″, which is fitted in a vertical slot in the socket block in engagement with the tumblers, G.

The tumblers, G, are, in this instance, provided with two peripheral slots at points directly opposite each other, the slots engaging with the spring-pressed toothed plate, E″, and having one or more cam faces with which the toe or point of the dog bolt, D, engages, each tumbler being also perforated for the reception of the lock key, K. Between these tumblers, which in this combination are arranged in pairs, a series of twin wards are interposed, which are called the right and left hand wards, according to their position. These wards, I I′ (shown in the detail views), are each provided with an outwardly projecting arm. These tumblers and wards may be easily disposed in a variety of different arrangements and combinations, and arranged to fit several different keys accompanying each lock, each of which is adapted to fit the lock in one of its different combinations. The owner thereof may, therefore, by removing the cover or plate of the lock and redisposing the wards and tumblers to act with the different keys, have in effect several locks; or in the event of losing a key he may change the combination to another key, and obtain a lock which the lost key will not open, without the trouble and expense of buying a new lock or getting a new key made.

The key, after being inserted in the key hole, slips easily by the first pair of tumblers, and its further progress is arrested by the projecting left-hand ward. However, by exerting a slight pressure the wedge-shaped point of the key will operate to force the ward back by overcoming the tension of the spring, which presses the toothed plate, E″, in engagement with the tumblers and allows the key to pass the next pair of tumblers, the next obstructing ward being forced back in the same manner as the first, and so on through the series, the tension of all of the wards being removed when any one has been moved back. As before described, the laterally projecting arm of the left-hand ward, I, is received in and extends to the bottom of a slot in the toothed plate, E″, which latter has engagement with the peripheral slots of the tumblers. It will therefore happen that when the ward is forced inwardly by the ribbed key it will overcome the tensional force of the spring and carry the tooth plate back flush, and thus release its engagement with the slots in the tumblers, which may now be rotated to the right or left, to present the cam faces of the tumblers to the dog bolt, D, allowing it to fall and release its engagement with the abutment, d''.

This lock was recently patented by Mr. E. A. Kimball, of Champaign, Ill.



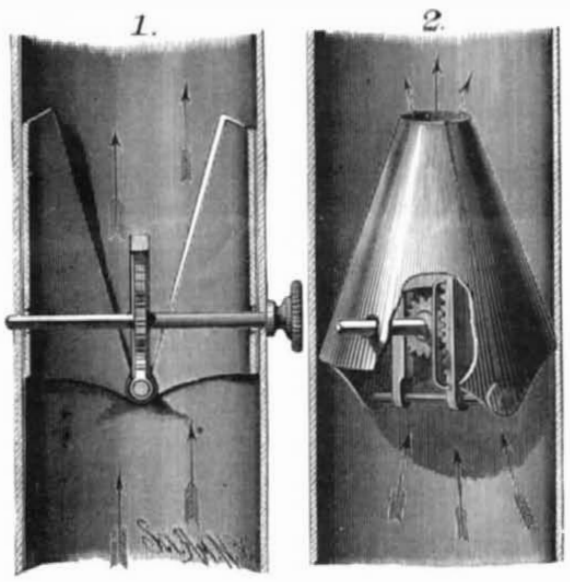
KIMBALL'S LOCK AND REVERSIBLE LATCH.

Ultramarine Papers.

According to a writer in the *Pharmaceutische Zeitung* a room covered with a paper in which ultramarine has been largely used was found to have an unpleasant odor of sulphureted hydrogen, the source of which long escaped detection. It was ultimately found that the ultramarine in the design was being gradually decomposed by the alum forming an ingredient in the paperhanger's paste. Leaving on one side the possible injury to the health of the inmates, the tarnishing of silver, brass, etc., a design in which ultramarine occurs, bears the germs of its own destruction. If any chrome yellows, lead whites, etc., are present, they will be blackened just in proportion as the ultramarine fades. Of course all white lead paints, or indeed other colors into which lead enters, will turn grim at the same time.

IMPROVED DAMPER.

The engraving shows an improved damper for stoves and furnaces, recently patented by Mr. Nathan Picot, of 986 Lorain street, Cleveland, Ohio. It consists of a truncated



PICOT'S DAMPER FOR STOVES AND FURNACES.

hollow cone divided vertically and hinged together upon a rod which extends across its base. This rod carries a rack, also a guide for a pinion placed on a spindle extending transversely through the cone above the rod referred to and at right angles to it. This spindle extends through the stove pipe, and is provided with a knob or wheel by which it may be turned. By turning the knob in one direction the rack and rod are thrown down, closing the two parts of the cone together, as shown in Figure 1. By turning the knob in the opposite direction, the two halves of the cone are thrown apart, as shown in Figure 2.

The inventor claims that this damper effects a saving of a large percentage of fuel; that it is impossible to close it so as to cause gas to escape from the stove; and that it affords a complete control over the fire.

One Million Lines to the Inch.

Mr. G. Fasoldt says, in a letter to the *American Journal of Microscopy:*

I have ruled plates up to 1,000,000 lines to the inch, one of which was purchased by the United States Government at Washington.

These plates show lines truly and fairly ruled, as far as lenses are able to resolve, and above this point the *spectral* appearance of the bands in regular succeeding colors (when examined as an opaque object) shows, beyond doubt, that each band contains fairly ruled lines up to the 1,000,000 band.

I do not believe that I will ever attempt to rule higher than 1,000,000 lines per inch, as from my practical experience and judgment, I have concluded that that is the limit of ruling.

RECENT INVENTIONS.

Printers of book, news, and jobwork of any kind will do well to examine the very simple and efficient galley foot lock patented by Mr. William J. Adams, of Philadelphia, Pa. This device consists of two parts, one of which is a right angular bar, having a long arm which extends across the bed of the galley, and a short arm which lies flat against the galley side and is tapered on its inner face. The long arm of this bar is preferably made extensible to adapt the lock to different widths of galley. The other part of the device is a sliding clamp recessed on its under side and constructed to hug the side piece of the galley and the tapering arm of the bar, upon which it exerts a wedging action, so as to lock the said bar and the foot of the column of type rigidly in place.

Mr. Charles L. Work, of Freeland, Ohio, has patented an improved pillow sham. The invention consists of a pillow sham made of *papier mâché*, or other suitable stiff material, in the form of a pillow with an opening in its back for the insertion of an ordinary pillow. A pillow sham thus constructed is not only cheap, but will keep its shape, and is capable of holding large and small pillows with equal facility.

A coffee cleaner, which would appear to thoroughly perform its work, has been patented by Mr. Abram Wakeman, Jr., of New York city. The object of this invention is to facilitate the removal of dust and other impurities from coffee berries. The invention consists in a combination of two oppositely revolving cylinders, the outer one having spikes and longitudinal ribs on the inside, and the inner cylinder being provided with spikes on the outside, whereby the berries may be introduced between the cylinders, carried up by the ribs, dropped on the spikes of the inner cylinder, and thence thrown against the spikes of the outer cylinder. The berries thus pass back and forth between the spiked shells of the two cylinders, and, by their rubbing against each other and the spikes, have all the dirt rubbed, scraped, and knocked off them before reaching their place of discharge.

An improvement in sofas and lounges having their head or end portions adjustable into different positions, which comprises a very simple and durable adjusting mechanism, has been patented by Mr. Theodore Hofstatter, Jr., of New York city. It consists in a combination with the adjustable head or end of the sofa or lounge, adapted to swing on the main frame, of end-bent latch bars, fulcrumed on the side pieces of said head or end, and made to engage by springs with curved racks on the side rails of the main frame, to hold the head or end in position. These latch bars are released from the racks, when it is required to adjust the head or end, by turning a shaft having cams which act upon the latch bars.

An improved clothes rack has been patented by Mr. William J. McCallen, of Bradford, Pa. The object of the invention is to provide a new and improved device on which a large quantity of clothes can be suspended in a very small space. The invention consists in a series of wires or lines secured to blocks sliding on wires attached to the base of a frame and passing over a roller to the ends of arms of this frame. These blocks are attached to ropes or cords passing over suitable pulleys, and also attached to a ratchet drum, whereby the lines or wires can be raised or lowered, as may be necessary. A clothes drier thus constructed meets all the requirements for which it is designed, and may be made either portable or stationary.

Mr. William H. Jenkins, of Girard, Ill., has patented an improved reach for carriages. In this improvement the reach is fitted with an enlarged metal head, and is fitted to turn within a shouldered metal sleeve secured to the rocker and the axle, said head engaging with the shoulder in the sleeve to unite the reach with the axle. By this construction the axles of a wagon or carriage are free to move up and down when the vehicle is moving over irregularities in the road, without bending the braces or subjecting the reach to tortuous strain and exposing it to breakage.

A very simple and serviceable faucet has been patented by Mr. Thomas J. Loftus, of Sacramento, Cal. The object of the invention is to provide a new and improved combined bung and faucet which does not project any further from the barrel than any ordinary bung, and is ready for use at all times. The invention consists of a hollow plunger having a threaded front end, and fitting into a tube closed in the rear and which is screwed into the bunghole. This tube is provided with a series of apertures in its sides, through which the liquids or gases pass into the tube and from thence through the hollow plunger, when the latter is drawn outward, but which apertures are closed by the plunger when it is pushed inward, and secured by slightly screwing it into the tube.

Mr. Charles W. Black, of Cuyahoga Falls, Ohio, has patented a very simple and useful wire stretcher. The invention consists in a novel means for stretching wires, such as are used for farm fences, the same comprising a frame provided with devices for holding it in position on a fence post, and constructed to carry a windlass, which, by the aid of a rope and clamp, serves to stretch the wire taut. Said frame may also be provided with a cam and serrated button for retaining the wire while a second hold is taken with the rope, in case the first operation does not tighten the wire sufficiently.

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ELECTRICITY BY MAGNETIC INDUCTION.

BY GEO. M. HOPKINS.

The peculiar species of energy residing in magnetic bodies is capable of a wide range of practical application aside from its extensive use in telegraphy and telephony; and since the permanent magnet, provided with proper accessories, furnishes an ever-available means of converting mechanical force into electrical energy, it may for very many uses be substituted for the battery without the loss of materials inseparable from this use of batteries.

To Faraday we owe the inversion of the process of magnetization—that is, the generation of electrical impulses in a coil by means of a permanent magnet. Upon this fundamental discovery are based all induction machines and instruments. The mode of producing the current varies in the different applications of the magnet, but the same general principle is necessarily involved.

It is not the design of this article to treat on all means and methods of producing induced electrical currents, but to describe a few electrical appliances and machines in which ordinary permanent magnets are the means for converting mechanical force into electric energy.

A common method of magnetizing steel is to place it in a coil and then connect the coil with the poles of a battery or some other form of current producer. Faraday's experiment (Fig. 1) was the reverse of this process, and consisted in suddenly inserting a permanent magnet into the coil, A, the latter being connected with a galvanometer, B, to indicate any action that might occur.

In this experiment when the magnet is inserted in the helix the galvanometer needle is instantly deflected, and the magnet being allowed to remain the needle immediately falls back to 0° of the scale. If the magnet be now suddenly withdrawn the needle is momentarily deflected in the opposite direction. To insure success in this experiment it is necessary to move the magnet very quickly, for if the magnet be slowly introduced or slowly withdrawn from the coil no perceptible effect will be produced.

Although coils of rather coarse wire are preferred for the magnetization of steel, and coils of very fine wire are better adapted for induction experiments, the reciprocal action of the electric current and magnet may be strikingly illustrated by employing a magnetizing coil of wire of medium size in connection with suitable battery power to magnetize the steel bar, and then by substituting a delicate galvanometer for the battery, and by introducing the magnet into the coil, a current is induced in the coil, as indicated by the galvanometer, showing that the battery current has imparted to the steel a quality which is capable of inducing a current in the wires of the coil.

It makes no material difference in the result, whether a magnetized steel bar is introduced into the coil, as in Fig. 1, or whether the coil is provided with a soft iron core capable of being magnetized by induction, by contact with, or proximity to, a permanent magnet. Fig. 2 illustrates an experiment of this kind, in which the coil, A′, of very fine wire, is provided with a permanent soft iron core, and is connected with the galvanometer, B′. By placing the poles of a permanent horseshoe magnet in contact with the projecting ends of the soft iron core of the coil, the core instantly becomes a magnet by induction, and a current is set up in the coil in the same manner as in the former experiment. When the magnet is removed the magnetism of the core departs, which is equivalent to the removal of the magnet from the coil in the first experiment, and the result is a momentary current in a direction opposite to that of the first.

The inductive effect of the magnet is much the same if the bobbin of fine wire be placed around a permanent magnet and the magnetic tension be disturbed by the application and removal of an armature. The Bell telephone (the essential parts of which are shown in Fig. 3) is a familiar example of this species of generator of induced currents. When the diaphragm, acting as an armature, approaches the magnet, a momentary current is set up in the bobbin, A″, in one direction, as indicated by the galvanometer, B″, and when the diaphragm recedes from the magnet the current set up in the bobbin is in the opposite direction. In the telephone these currents have sufficient power to operate a second instrument of the same sort; but owing to the fact that the armature is very light, and never touches the magnet nor recedes very far from it, and the further disadvantage arising from the use of a bar magnet, the apparatus cannot rank high as a generator of electric currents, however well it may serve the purpose of a telephone.

Another form of apparatus (Fig. 4), operating on the same principle, generates currents sufficiently powerful to work a polarized bell or annunciator over a line several miles long. This magneto key is made by clamping two 6-inch horseshoe magnets upon opposite sides of two soft iron pole extension pieces, *a*, one-half inch in diameter, one and a half inches long, and projecting one inch beyond the poles of the magnets. Each extension piece is provided with a bobbin, D, one inch long and one and a quarter inches in diameter, filled with No. 36 silk-covered wire. These bobbins are wound and connected like the spools of an electro-magnet, and have a combined resistance of 200 ohms.

In front of the poles of the magnet an armature, E, one-quarter inch thick, a little longer than the width of the extremities of the magnet, and about one inch wide, is pivoted at its lower edge, and provided with a key lever by which it may be drawn from the poles of the magnet. A spring under the key lever throws the armature back into contact with the magnet. This is a simplified form of Breguet's exploder used in firing mines, and although much smaller than the apparatus referred to, it is capable of ringing a polarized bell over fifteen or twenty miles of wire, and will give a powerful shock. It is a convenient and inexpensive apparatus for signaling, and is particularly adapted to the telephone when used in connection with the polarized annunciator or polarized bell, presently to be described. In this apparatus like poles of the magnets must oppose each other, and the clamping pieces and screws should be of non-magnetic material. If two magnets do not produce a current of sufficient strength two more may be added.

In this form of magneto-induction apparatus the action of the magnet and coil is identical with that of the Bell telephone. The rational explanation of this action may be found in the action of two permanent horseshoe magnets having their unlike poles in opposition. In this case the opposing poles neutralize each other to such an extent as to almost destroy all magnetic effects. It amounts to the temporary demagnetization of the steel. On separating the poles of the two magnets they regain their normal magnetism. The case is precisely the same with the magnetic key. The armature, E, when applied to the pole extensions, becomes a magnet by induction, and by its reaction upon the magnet neutralizes the power of the magnet and produces nearly the same result as withdrawing the magnet from the bobbin. When the armature is withdrawn suddenly from the magnet the effect upon the wires of the bobbins is the same as would be produced by introducing into them the poles of the magnet.

To render the electrical pulsations of this class of machines continuous the armature may be rotated, as shown in Fig. 5, which represents a modification of an old and well-known magneto-induction machine, in which the bobbins, D′, are placed on pole extensions of the magnets, C′, and the variations in magnetic force are produced by the wheel armature, E.

Another method of generating currents by a rotary movement of the armature is to make the armature in the form of an electro-magnet, and mount it upon a rotating spindle so that it may revolve in close proximity to the poles of a strong permanent horseshoe magnet. This form of machine, which is the invention of Clarke, is shown in Fig. 6. It has long been used for medical purposes, and before the invention of the more recent machines was employed for electro-metallurgy and for other purposes.

The electro-magnetic armature, G, is mounted on a shaft, so that it may revolve very near but not in contact with the poles of the compound magnet, F. One of the terminals of the bobbins is in electrical connection with the shaft, the other is connected with an insulated ferrule on the shaft. The alternating current is taken off by two springs, one touching the insulated ferrule, the other bearing against the shaft. When the current is required to flow in one direction the insulated ferrule is split longitudinally into two equal separate halves, each of which is connected with one terminal of the armature wire. This split ferrule, together with springs, H, which press upon its diametrically opposite sides, forms a commutator which sends the momentary currents of like name all in one direction.

The slots of the ferrule are arranged relative to the springs, H, and armature, so when the polar faces of the armature cross a line joining the poles of the permanent magnet the springs will leave one-half of the ferrule and touch the other half.

Fig. 7 shows a modification of Clarke's machine, in which the permanent magnet, F′, is provided with pole extensions of soft iron surrounded by fine wire bobbins, D″. These bobbins are connected like an electro-magnet, and when the armature, G′, is turned so as to send a current through the springs, H′, an alternating current may be taken from the bobbins, D″.

Fig. 8 shows a kind of commutator designed for short circuiting the machine through a part of the revolution, so that when the short circuit is broken a direct extra current capable of giving powerful shocks will pass over the conductors leading from the machine. Each half, *d*, of the commutator ferrule is provided with an arm, *e*, terminating in a curved piece, *g*, attached to opposite sides of the insulating cylinder, *c*. The curved pieces, *g*, are pressed by springs which are electrically connected with the commutator springs on their respective sides of the cylinder, so that when the piece, *g*, is touched by its spring and the ferrule, *d*, is touched by its spring—the two springs being in electrical communication with each other—the machine is for the moment short-circuited, but when contact with *g* is broken the extra current passes by the usual channels from the machine.

A magneto-electric machine, equal in power to about six Bunsen elements, is shown in Figs. 9, 10, and 11. The compound field magnet is composed of twelve six-inch horseshoe permanent magnets, K, arranged in two groups of six, with their like extremities clamped between curved soft iron bars, J, as shown in the vertical longitudinal section, Fig. 11. These bars consist of sections cut from common wrought iron washers, 3 inches external diameter, ¼ inch thick, and having a 1⅝ inch hole through them. The washers are all drilled to receive the bolts, *h h*, before they are cut in two. The washers, J, and magnets, K, are placed in alternation and clamped between brass angled plates, L, by which the middle portion of the field magnet is fastened to its base. The magnets are further secured to the base by standards, *j*, which clamp the sides of each group of magnets, the magnets being kept the proper distance apart by interposed strips, *i*.

The bars, J, are cut away on the inner edges, forming an approximately elliptical opening for receiving the armature, I, which is a very little less than 1⅝ inch in diameter, and is 3½ inches long. It is of the earlier Siemens type, and is wound with four parallel silk-covered No. 32 wires, which terminate in eight insulated metallic blocks on the switch, M, one block to each end of each wire. The switch is shown in detail in Fig. 12—1, 2, 3, 4, 5, 6, 7, 8, being the terminals of the wires of the bobbin. The blocks 1 and 5 represent the ends of the first wire, 2 and 6 representing the ends of the second wire, 3 and 7 the third, and 4 and 8 the fourth; 15 and 16 are curved brass pieces capable of being plugged into connection with the blocks just mentioned, by means of screw plugs, shown in place in the engraving. The pieces, 15 and 16, are connected respectively with the two halves, O P, of the commutator cylinder.

At the ends of the curved pieces 15, 16, there are metallic blocks, 17, 18—the block 17 being connected by a wire with the metallic boss of the rubber wheel upon which the switch is mounted; the block 18 being connected by a wire with a brass ring, Q, on the rubber support of the commutator.

Inside the blocks 1 to 8, there are six metallic blocks, 9, 10, 11, 12, 13, 14, connected together by wires as shown. The opposite sides of the commutator cylinder are pressed by springs or brushes, R, which are sustained by an insulating support and are provided with binding posts for receiving the wires for conducting away the direct current. A spring, T, touches the end of the armature shaft, and has a binding post for receiving a wire conductor, and a spring, U, sustained by an insulator attached to the angle plate, L, has a binding post for receiving a conductor.

The armature is of very soft cast iron of the usual form,* and its shaft is provided with a pulley for receiving power.

This machine will yield currents of three different intensities, and will deliver them either direct or alternating, and it answers admirably as a motor.

To obtain a quantity current the screw plugs are inserted as shown in Fig. 12, so as to connect 1, 2, 3, 4, with 15, and 5, 6, 7, 8, with 16. In this condition it may be used as a motor. The success of the machine as a motor depends in a great measure on the adjustment of the commutator. Its slit should be opposite the center of the open space or groove in the armature.

To secure a current of higher tension connect 5 and 6 with 16, connect 1 to 2 and 2 to 11, connect 12 to 7 and 7 to 8, and finally connect 3 and 4 with 15. To get the highest tension connect 5 to 16, 1 to 9, 10 to 6, 2 to 11, 12 to 7, 3 to 13, 14 to 8, and 4 to 15. Direct currents are taken from the springs, R, alternating currents are taken from the springs, T, U, after connecting 15 to 17 and 16 to 18 The quantity current is obtained from four parallel wires, which are equivalent to one wire having four times the sectional area of the single wire and one-fourth the length. When the medium current is secured the wire is doubled, so that it is equivalent to a wire having twice the sectional area of the single wire and one half the length. For the high tension current the full length of wire is used single.

Fig. 13 shows a method of building up a field magnet from common bar magnets. They are let into and clamped on a block of wood so as to project lengthwise over the armature. An iron cap placed against the fixed ends of all the magnets completes the arrangement.

A further use for permanent magnets is found in polarized bells, relays, and annunciators. Fig. 14 represents a Siemens polarized bell, in which an iron yoke, *m*, is supported from the elongated ends of the yoke of the magnet, *l*, by two brass studs. The yoke, *m*, supports the pivots of the bell armature, *n*, also the studs upon which the bells are placed, and to it is secured the magnet, *p*, which is bent under the yoke of the magnet, *l*, without touching it.

Fig. 15 shows a similar but simpler device, in which the poles of the magnet, *l′*, are fitted with a brass yoke, *m′*, which supports an iron frame in which is pivoted the armature, *n′*, and to which the bell is attached. This frame has a socket *o′*, for receiving one of the poles of a horseshoe magnet, *p*, the other pole of which touches the yoke of the magnet, *l′*.

The polarized annunciator shown in Fig. 16, has two soft iron cores, *r*, carrying two bobbins of fine wire connected like the spools of an electro magnet. In front of these soft iron cores there is a light delicately pivoted plate, *s*, of iron, which is held in contact with the cores, *r*, by magnetism induced in them by a magnet, *t*, clamped in the middle and capable of being adjusted by a spring and screw at the bottom. The iron annunciator plate, *s*, has sufficient inclination to cause it to drop if released from the cores, *r*. The magnet is placed so near the cores, *r*, as to impart to them just enough attractive force to hold the plate, *s*, and no more.

The polarized bells and annunciator may be worked by either of the instruments shown in Figs. 4, 5, 6, 7, and will be found for many uses preferable to electric bells and annunciators operated by battery currents.

Naval and Submarine Engineering Exhibition.

An international exhibition of naval and submarine engineering appliances is announced to be held in London, in April, 1882. It is intended to cover the wide field occupied in the production of machinery and mechanical contrivances employed in shipping, harbors, etc. Prizes are to be given for the best means of saving life in case of shipwreck, and for the best invention of a humane character connected with sea-faring matters.

*See description of Simple Dynamo Electric Machine, in SUPPLEMENT, No. 161.

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MISCELLANEOUS INVENTIONS.

Mr. Samuel Heaton, of Cedar Rapids, Iowa, has patented an improved fence post. The object of the invention is to improve the construction of fences, more especially those made of vertical iron posts carrying longitudinally stretched iron wire, and the invention relates more particularly to a fence post stiffened at its lower portion by a triangular rod brace, the base and greater portion of which is below the upper surface of the ground. In the present improvement the upper extremities of the triangular brace are curved or bent outward over a link or loop which takes against both sides of the post and holds the bent ends of the brace firmly against the edges of the post. A locking link passing through a slot in the post, and secured by a key on one side of the latter, also serves to hold the base portion of the brace to the other side of the post. This construction makes a very strong and efficient fence post.

Mr. Henry Cutler, of North Wilbraham, Mass , has patented an improved steam grain drier. This invention relates to steam grain driers in which the grain is introduced at the upper end of a rotating inclined cylinder, heated internally by steam tubes, and is discharged at or near the lower end of the cylinder. In a drier constructed according to the invention the grain, in its travel through the cylinder, passes over and around the drying pipes in a downward spiral direction. The apparatus embraces various novel details which augment its convenience and efficiency, the same including a spider at the upper end of the cylinder with curved arms and a conical flange to receive the grain and holes for the steam pipes, a cylinder casing provided with ventilating apertures protected from escape of the grain therethrough, buckets on the exterior of the casing for directing the discharge of the grain, additional drying pipes within the cylinder, and improved means for introducing the steam and carrying off the water of condensation.

Mr. George W. Blake, of Port Townsend, W. T., has patented an improved harness for use in working or in breaking a horse, and also in driving vicious horses, the object being to permit freedom to the animal in walking or trotting and prevent kicking and running. The invention comprises a breast strap, ham straps buckled to the breast strap and passing around the hind legs, and a series of straps supporting the two former straps, the whole forming a harness for breaking and controlling the horse. Combined with this controlling harness is a breeching strap passing around the butt, and safety reins provided with a nose strap and controlled by an elastic strap. This safety harness binds the animal in a harmless manner, without checking his freedom, and is a very efficient contrivance for the purposes it is designed.

Mr. Ogden H. Tappan, of Potsdam, N. Y., has patented an improved hand stamp for post-office use. The invention consists of a hand stamp carrying two parallel rolls, one to postmark, the other to cancel, and both receiving their supply of ink from the same superimposed reservoir in the handle and the same intermediate feed. By slightly tilting the stamp in reverse directions either roll is brought to bear upon the letter as required. This forms a cheap and effective stamp, and one which can be used rapidly and on all kinds of mail matter.

A new composition of matter, for the production of artificial stone, has been patented by Messrs. Carl Grünzweig and Paul Hartmann, of Ludwigshafen-on-the-Rhine, Germany. The materials used in the production of this stone are pulverized cork, clay, sand, and cement, hydrate of lime, soluble glass, hair, and water in certain proportions, the same forming a stone which is light but strong, and especially adapted for partitions in upper stories which are not supported by a lower partition. Such artificial stone is free from dampness and not liable to speedy decay.

Mr. William H. Hall, of New York city, has patented a cheap and serviceable waterproof cap. The invention consists of a cap composed of a waterproof body, which may be made of linen or other suitable material, blocked into shape, and coated with a shellac solution, a lining of silk or other material firmly united to said body, a loose cover secured to the lower portion of the body, and a peak or front. With this construction, should the cover shrink or stretch from being wet, the stiff waterproof body will keep it in place and cause it to return to its proper shape when dry.

An improved key ring, capable of being easily opened and securely closed, has been patented by Messrs. Bryant H. Melendy and William J. Boynton, of Battle Creek, Mich. The invention consists of a flat ring divided transversely so as to present meeting ends, preferably of an irregular form, and the one end portion of which has a notch in its outer edge, while the other end portion of the ring is provided with a pivoted clasp, in which is a cross piece that engages with the notch. Said clasp also has an indentation into which a projection on the notched end portion of the ring snaps when the clasp is closed. The outer edge of the clasp is flush with the outer edge of the ring, accordingly it has no projections to tear and rip the pockets.

Mr. Frank J. Gould, of Sidney, Ohio, has patented a magazine stove, which has many advantages over or as compared with magazine stoves as ordinarily constructed. The magazine of the stove has a vertical row of perforations which connect with a tube closed at its top but open at its bottom, and connected with the outside air by means of a lower branch pipe, whereby the gases from the coal within the magazine are inexplosively consumed in the stove. A chamber for the heated products of combustion is formed above the magazine, which is disconnected from the shell of the stove, thereby exposing all parts of the latter to the fire, communication with the upper chamber being formed by a reduction in an overhanging collar at the top of the magazine, which is some distance from the top of the stove. Furthermore, said magazine is independently supported within the shell, thereby admitting of its separate removal.

An improved hair tonic, which, applied as a wash to the head, avoids the formation of dandruff and strengthens and invigorates the hair, has been patented by Mrs. Caroline Weisser, of Los Angeles, Cal. The preparation consists of a decoction of dried olive leaves, marjoram leaves, marjoram roots, and of glycerine in certain proportions.

STEAM BOILER NOTES.

At midnight, November 10, a steam rectifying column in Gaff's distillery, in Aurora, Ind., exploded from overpressure of steam, with such terrific force as to shake the town. The inflammable vapor that arose from the liquor took fire from a burning gaslight, and about one hundred feet of the building was burned. William Fowler, a warehouseman, sleeping in the building, was killed, and his remains were found among the ashes on the following morning. The loss is variously estimated at from $25,000 to $40,000. Insurance, $14,200.

Ten boilers in the extensive lumber and salt manufactory of Hamilton, McClure & Co., six miles below East Saginaw, Mich., exploded about 5 A.M., November 13, wrecking property to the extent of $25,000, and killing four firemen, Michael and Joseph Lehan, Frank Blanchard, and Charles Carpenter. The brick boiler house and brick chimneys were leveled with the ground, and the mill and salt block badly damaged. The *débris* was scattered in every direction, pieces coming down half a mile distant.

Low water, as usual, is said to have been the cause of the above explosion. It is to be hoped that competent boiler inspectors will find their way to the scene of this disaster in time to make an exhaustive examination; because the phenomena, as related by non-professionals, are such as usually attend the sudden liberation and expansion of a large volume of highly heated water, rather than such as arise from the collapse of an overheated internal flue, or the escape of steam from an overheated externally fired boiler shell in which there was little or no water.

The tugboat Lehigh, owned by William J. Wilson, of Albany, exploded its boiler November 14, between the main land and Starin's Glen Island, Long Island Sound, and one man was killed. The tug was engaged on the work of towing out of the harbor scows filled with mud and rocks taken from the work being done there by the government in deepening New Rochelle Harbor. There are two dredges at work in the harbor, one, the Niagara, belonging to Contractor Seward, and the other, the Kinderhook, belonging to E. M. Paine, of Albany. Mr. Seward had chartered the tug Lehigh to tow the scows out into deep water and dump them. This was generally done off Huckleberry Island, some distance down the Sound. Hugh Chard, of West Troy, N. Y., is the captain of the tug, and Warren C. Norris, of Albany, engineer. At about 12:30 P.M., the tug was lying at anchor alongside of a water boat, owned by Mr. Paine, some 600 feet from the shore and dredges. At this hour James Tillotson, the cook, was the only person on the tug. All at once there was a deafening report, and the spot where the tug had been was enveloped in steam and flying timbers. When the steam cleared away the tug had disappeared, not a vestige of it remaining, and the side and deck of the water boat, to which it had been attached, were torn to splinters. Tillotson's lifeless body was soon after taken from the water, it having been blown at least 150 feet from the tug by the force of the explosion. A large piece of the boiler was blown to Mr. Emmett's place on the mainland, some 700 feet distant. An ax and adz, which had been on the tug, were found on Hunter's Island. The boiler of the tug was inspected about a month before the explosion by Charles Harvey, a local inspector at Albany, and passed as all right and safe to carry at least 75 pounds of steam. The tug was overhauled and repaired about a year ago, and the boiler, then an old one, was put in. She was valued at $3,500.

The engineer said before leaving New Rochelle that, when he and the captain went off the tug to go fishing, he, as a precautionary measure, opened the furnace door under the boiler, and otherwise so attended to it as to be assured of its safety. He was positive that there was not over 60 pounds of steam in the boiler when he went away, and he could not explain why it exploded. It was learned in New Rochelle that some part of the boiler gave way a short time before the 14th, and it had to be patched up. The cause of this explosion seems to be "engineer went a-fishing," left steam up and fire burning, with, probably, an inefficient safety valve.

Electrical Steel Melting.

On Tuesday, October 11, the members of the Iron and Steel Institute visited the telegraph construction works of Messrs. Siemens Brothers, at Charlton, on which occasion Dr. Siemens, F.R.S., exhibited his experiment of melting steel by means of the dynamo-electric current, when five pounds of steel were melted in five-and-twenty minutes. The apparatus employed consists of an ordinary crucible of plumbago, or other highly refractory material, placed in a metallic jacket, or outer casing, the intervening space being filled up with pounded charcoal, or other bad conductor of heat. A hole is pierced through the bottom of a crucible for the admission of a rod of iron platinum or dense carbon, and the cover of the crucible is pierced for the reception of the negative electrode, which is suspended at one end of a beam by means of a strip of copper. The other end of the beam is attached to a hollow cylinder of soft iron, free to move vertically within a wire solenoid, one end of which is connected with the positive and the other with the negative pole of the electrical arc.

Obviously it matters not how the electricity used in this experiment may have been generated. Any source of power might be employed for driving the dynamo machines. In other words, steel may be melted by water power.

Note on the Estimation of Copper in the State of Subsulphuret.

BY ANTONY GUYARD (HUGO TAMM).

In the French edition of Fresenius's analytical chemistry ("Traité d'Analyse Quantitative," Paris, 1875, page 281) Fresenius describes the method of estimating copper by calculation of its sulphuret in a stream of hydrogen gas at a red heat and obtention of this metal in the state of Cu_2S, and he adds the curious following statement, formed partly of a quotation from Ulrici and partly of his own remark. I translate it here literally: "If instead of calcining the precipitate of sulphuret of copper in a stream of hydrogen it were heated to redness in a closed crucible, that the crucible be abstracted from the fire from time to time and opened during a few seconds, the compound, Cu_2S,CuO, more or less mixed with oxide or sulphuret of copper, would be obtained. But since Cu_2S and CuO contain the same percentage of copper the amount of copper may be calculated from the above residuum (Ulrici). *So presented, the method is more simple; however, the results obtained are not so exact.*" (The latter words in Italics are Fresenius's own.)

On principle Ulrici is perfectly correct, and, on the other hand, whoever has consulted Fresenius's works knows what reliance can be placed in the statements of this eminent analyst.

However, the contradiction apparent in the above paragraph attracted the attention of the writer, who investigated the matter, and found that, as is so frequently the case, the phenomenon is more complicated than was supposed, and consequently not in accordance with theory which was simple.

When subsulphuret of copper is calcined with access of air in the conditions adopted in analysis, it is not the mixture, Cu_2S, CuO, which is obtained, but, on the contrary, the mixture Cu_2S,Cu_2O. This is readily proved by treating the residuum with hydrochloric acid It is then found that a large proportion of Cu_2Cl is formed, the white subchloride of copper, which becomes insoluble when its solution is treated with an excess of water. Cu_2S being insoluble in hydrochloric acid, the subchloride obtained can only be formed by the suboxide, Cu_2O, existing in the mixture.

The theory of the formation of a mixture, Cu_2S,Cu_2O, is easily found in a fact overlooked by Ulrici, and which is probably exposed here for the first time, that when CuO is formed in presence of Cu_2S it reacts upon it with formation of sulphurous acid and suboxide of copper, as is indicated by the following formula:

$$2(Cu_2S)+6(CuO)=Cu_2S+4(Cu_2O)+SO_2.$$

When Cu_2S is heated in the air for a sufficient time, besides Cu_2S and Cu_2O found in the proportion indicated in the above formula, a little CuO is also detected, showing that this oxide is really formed during calcination, but is constantly destroyed by the existing subsulphuret.

Charles Benedict.

Hon. Charles Benedict, of Waterbury, Conn., died of heart disease on October 30, on board the steamship Wisconsin, on his way from England. Mr. Benedict had gone abroad for business and pleasure, and had been on the Continent about six weeks. He was apparently in good health when the Wisconsin left Liverpool. On Sunday, after divine service on shipboard, he complained of a pain in the left side. Surgeon Fottrell prescribed for him, and he went to his cabin. At 11:30 the surgeon found him dying. He expired in a few moments. Mr. Benedict was closely identified with all the large manufacturing interests of the Naugatuck Valley, being of the firm of Benedict & Burnham, of New York and Waterbury. He was president of the Waterbury Watch Company, Waterbury Clock Company, Waterbury Pin Company, and president of the Mitchell & Vance Company, dealers in gas fixtures, of New York. Mr. Benedict was at the time of his death sixty-two years of age. His father, Aaron Benedict, founded the firm of Benedict & Burnham, at 13 Murray street, in 1812. On the death of his father Charles Benedict assumed control, and had been actively concerned in its management for twenty years. He was well known in Connecticut, and had great influence in the State, though he never entered to any extent the field of politics. He was mayor of Waterbury in 1860, a man of liberal ways, public spirited, and widely esteemed.

John L. Hobbs.

John L. Hobbs, one of the oldest glass manufacturers in the United States, and discoverer of the use of lime in the manufacture of glass, died in Philadelphia, November 1. He was a member of the firm of Hobbs, Brockunier & Co., but was not actively engaged in the business. He had been identified with Wheeling industries since 1844, and was born at Fort Moultrie, S. C., in 1814.

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NOVEL TICKET REEL AND RECEPTACLE.

The engraving shows a machine for tallying, recording, or indicating the numbers of fares collected upon cars or other public passenger vehicles. It is of the class employing, in connection with a locked box or receptacle carried by the conductor or collector, duplicate, double, or sectional tickets, one portion or section of which is given to the passengers when the fare is collected, while the other section or duplicate is deposited in the box, so that as the conductor is compelled to deposit a ticket or check in the locked box as each fare is collected, a tally or record is made of the amount to be accounted for, and fraud and cheating is prevented.

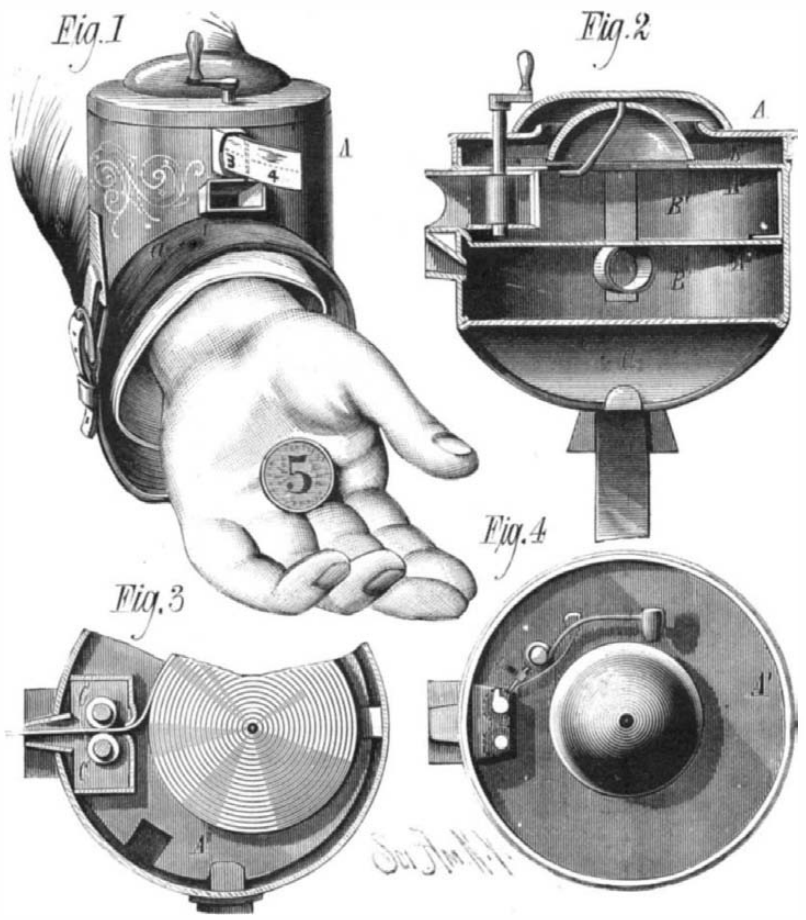
Fig. 1 shows the apparatus as fitted and secured to the conductor's arm in a convenient position for its operation and for the deposit of the tickets or checks by the hand of the opposite arm; Fig. 2 is a vertical section; Fig. 3 is a horizontal section showing the roll of tickets, and Fig. 4 is a top view with the cover removed showing the alarm bell.

The casing, A, is of the shape shown, having a curved bottom, *a*, to fit the arm. Near the top of the casing is a transverse partition plate, A′, which separates the casing into two compartments, the upper and smaller one, B, being for the reception of the alarm bell and its striking mechanism, while the lower compartment, B′, is for the checks or sections of the tickets, which are to be deposited in the receptacle, one for each fare as collected. The curved bottom, *a*, of the ticket or check receptacle is hinged at one side of the body of the casing.

The alarm bell is fastened in the center of its compartment, B, to the partition plate, A′, and is covered and protected from external blows by the cover of the casing, which fits upon the upper end of the cylindrical body. The striking mechanism consists of a hammer acted upon by a spring and tripped by a crank or handle outside of the case. Secured to or forming part of the shaft of the crank or handle inside a small compartment, there is a roller, C, which, in conjunction with another roller, C, constitutes feed rollers for the tickets. These tickets are formed in strips, or are in what is commonly known as "ribbon form," and wound into a compact roll, as shown in Fig. 3, the roll being then placed in the apparatus, just back of the feeding rolls, upon a removable partition plate, A, in the ticket compartment. Each ticket is joined to the contiguous one by a readily separable connection, the tickets being formed, for example, in a long strip, and separated partially by a series of transverse perforations. Each ticket is a double or two-part ticket readily separable.

The operation of the apparatus is as follows:

It having been fitted to one arm of the conductor and secured by a strap, and the tickets having been placed in the machine with the first one between the feed rolls, upon receiving a fare the conductor turns the crank to the extent of one revolution, which projects a ticket from the delivery spout and rings the bell. The ticket is then separated from the strip. The section or portion with the number upon it is then deposited by the conductor in the locked receptacle, and the other section handed to the passenger, to be retained as evidence of the payment of the fare. At the end of the trip the apparatus is handed to the proper person, who inspects the tickets that remain unfed from the apparatus, and also counts the checks deposited in the box. If the number of tickets fed from the machine does not correspond with the number of checks in the box the dereliction in duty of the conductor is made apparent, and dishonesty exposed; while if the checks and tickets disposed of correspond, the amount to be accounted for is ascertained. This invention was recently patented by Mr. C. S. Locke, of Chicago, Ill.



LOCKE'S TICKET REEL AND RECEPTACLE.

NOVEL GRATE-BAR.

We give an engraving of an improved device for improving combustion in a boiler furnace where it is most needed, that is, at or near the bridge wall.

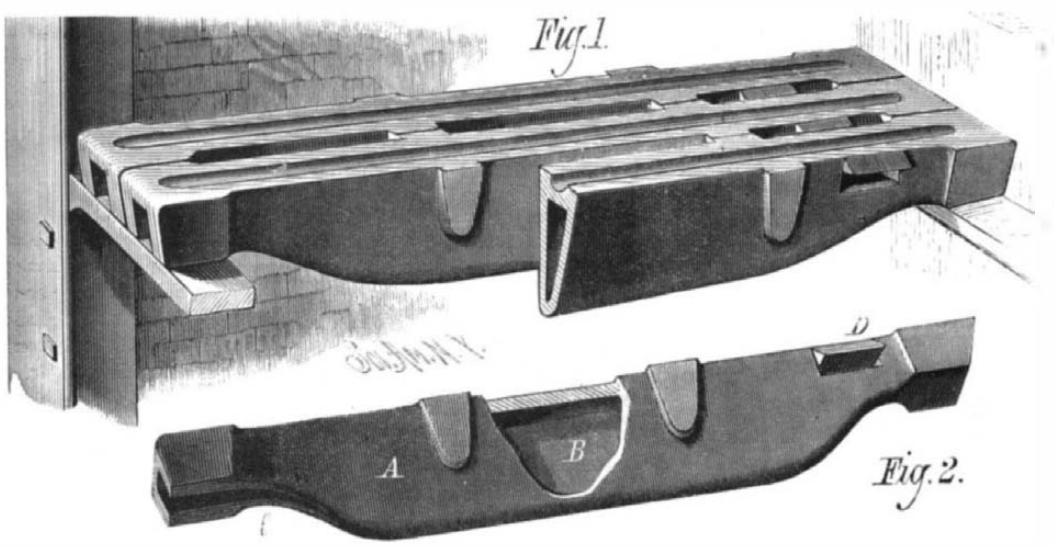
It is very essential, in order to maintain uniform combustion in a furnace, to supply the fuel with a uniform and sufficient quantity of air well distributed beneath it; and in furnaces as ordinarily constructed, having parallel grate-bars extending from the front backward, the air is taken up very largely by the front section of the fire, and the back part of the fire, or the part more remote from the draught, suffers in consequence, and an unequal combustion of the fuel and a consequent loss in the amount of heat developed therefrom result.

The engraving shows an invention, designed to provide the rear portion of the fuel with sufficient air to maintain a combustion equal to that of the front by introducing air thereto through a chamber or passage in each of the grate-bars; and in constructing this grate-bar to accomplish this purpose, the inventor has secured a lighter and stronger bar from the same amount of metal, and has provided means for keeping the bar cool enough to prevent its wearing, twisting, or warping under the influence of the heat.

It is well known among engineers that there is little real combustion at the rear end of the furnace, and that large amounts of unconsumed inflammable gases pass off without yielding their heat.

The Fairbairn grate-bar is proposed as a remedy for this defective combustion. It requires no changes of setting of boilers; no auxiliary draught; it needs no expensive alterations; it merely substitutes for the common grate-bar one that will allow the air to reach the entire surface of the fire-box; it carries the air to the furthest part of the furnace.

The bar, A, is cored in the casting so as to be hollow.



THE FAIRBAIRN GRATE-BAR.

with lateral or side apertures, D, at the rear end, or nearly so. As in ordinary grate-bars, the air passes up between the bars; as in ordinary grate-bars, the space occupied is the same; as in ordinary grate-bars, one, when defective, can be removed and another readily substituted.

Unlike other grate-bars, this one allows the air from the draught-hole in front of the furnace, and from the ash-pit, to traverse the length of the hollow bar, being heated in its passage, and emerging at or near the end of the bar, or the rear end of the furnace, giving out from the lateral openings a current of heated air that instantly inflames the escaping gases that might otherwise pass up the chimney without doing service, or performing work. It may be said that this hollow bar is a continuation of the draught-door, and gives as much a chance for perfect combustion to the coal at the rear end of the furnace as that at the front of the furnace. For further information address the Fairbairn Manufacturing Company, 272 Purchase street, Boston, Mass.

The East River Bridge.

When the contract was made for the steel work of the East River Bridge the amount named was 5,000 tons, which by mutual consent was agreed to cover 5,500 tons. This has been taken as the maximum weight of this portion of the superstructure. Naturally, therefore, there was not a little surprise when it was announced recently by the engineers that 1,200 tons more would be required, increasing the weight of steel in the superstructure to 6,700 tons. The principal reason given for this increase of weight is the need of strengthening the bridge to enable it to carry heavier loads than were contemplated at first. According to a statement by Assistant Engineer Martin, who has had charge of the practical work of construction from the first, the growth of the cities to be connected and the preparation of the elevated roads to carry freight trains have made it probable that direct railway connection will be made between the Long Island roads and the roads entering New York from the East, the North, and the West. At any rate, in anticipation of such traffic, the bridge plans have been modified to enable regular passenger and freight cars to run over the bridge, and the weight had to be correspondingly increased. As reported by the *Evening Post*, Mr. Martin said, in pointing out the chief instances in which increased weight had been made necessary to get increased strength:

The bridge will consist on each side of four massive steel beams, one on top of the other, into which are bolted the transverse beams upon which are laid the floor girders of the bridge itself. When it was decided to increase the strength of the bridge the method adopted was to run what are called "overfloor-stays"—wire cables which run down from the top of each tower at an angle of about 45°, and are fastened to the longitudinal steel beams which form the sides of the bridge. It follows that, when weight is put upon the bridge at the point where the overflow stays are fastened to the bridge, the strain falls upon the stays instead of the main cables and tends to press the bridge against the tower. In order that the bridge may resist this "back pressure" the steel girders between the tower and the point where the overflow stays reach the bridge have had to be stiffened and increased in size. This is the chief item of increase, and will reduce the weight upon the cables by about one-fifth. In the next place the Pullman cars are nearly three feet higher than the cars originally intended for bridge traffic, and that fact necessitated increasing the height of the 2,800 upright posts which divide off the steam tracks from the passenger and carriage roads. Thirdly, it may be assumed that all the castings used in the bridge are between two and three per cent heavier than the contract calls for, because the contractor prefers that to running the risk of having them rejected, as they are of no value except for bridge purposes. "There are other considerations," said Mr. Martin, "which have caused the engineers to alter different parts of the steel work in the bridge, but they would not be understood without long and technical explanations. I repeat that the 1,200 tons extra weight of steel have materially increased the strength of the bridge instead of weakening it, as the public seems to suppose."

Point Barrow Signal Station.

The chief signal officer has received from Lieutenant Ray, in command of the Arctic meteorological station at Point Barrow, a report of the successful planting of the station near the native village Ooglaamie, Alaska. The station is on the only high ground at Point Barrow, about eight miles from the extreme northern end of the Point, and on the northeast side of a small inlet which he has named Golden Fleece. The voyage was a long and very trying one, a heavy gale having been encountered off Cape Lisburne, driving the expedition out of its course to the north and west.

The landing was made September 8. The ground was covered with snow, and ice was forming rapidly at the date of the report, Sept. 15. Not having seen the sun since his arrival Lieutenant Ray had to depend on dead reckoning from his log-book in determining the position of the new station. He makes it latitude 71° 17′ 50″ north; longitude 156° 23′ 45″ west.

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Woven Electrical Wires.

A novel method of covering wire used for many electrical purposes has been devised by Professor A. E. Ayrton. The process is merely a modified form of weaving. The wire, which may be German silver, platinum, silver, etc., or simply copper or iron, if great cheapness of construction be desired, is wound bare on the shuttle and used as the weft, being woven backward and forward between parallel fibers of silk, cotton, or any suitable material employed as the warp. Or the wires may be arranged as the warp and the insulating material employed on the shuttle. The web, whether composed of a warp of wires and a weft of insulating material, or a warp of threads of insulating material and a weft of wire, may, if desired, be steeped in or passed through a bath of bitumen or melted paraffine wax or of other similar liquid, and an extra security of insulation and solidity is thus secured. It may be rolled or twisted up sideways to be placed in the bath. The web or ribbon, in the flat state as woven, can be easily painted with any fluid compound if desired, an ordinary paint brush being employed for the purpose, or the web or ribbon may be covered with gutta percha, or with some similar substance, by being passed through a die where the compound is under pressure.

Safety Car-Couplings.

Inventors and owners of car-coupling apparatus will be interested by the announcement of the State Railway Commissioners of Connecticut that they will give a public hearing upon the subject of safety couplings in the State Capitol, in Hartford. Nov. 29.

A bill is before the General Assembly of the State, the design of which is to compel all railway companies operating within the State to provide their cars with automatic coupling apparatus.

A Remarkable Arctic Voyage.

From a statement published in *Lloyd's List*, it appears that, during the past summer, Captain Adams, of the steam whaler Arctic, in his search for whales, not only succeeded in reaching Melville Bay, the usual limits of a whaling voyage to Baffin's Bay, but passed through Lancaster Sound, entered Wellington Channel as far as the water has been penetrated by any expedition, turned back and steamed up Barrow Strait, then took a course down Peel Sound, and reached within a few miles of the spot where the Erebus and Terror were lost. Retracing his path he visited Beechy Island, thence steamed down Prince Regent Inlet, and got as far south as Cape Nordenskjold on the west side and within fifteen miles of Fury and Hecla Strait on the east side of the Gulf of Boothia. It was only in this gulf that he met with success in getting whales, and that was not much.

Presuming that the course is described without exaggeration, though no mention is made of Queen's Channel or Franklin Strait, it is undoubtedly the most extraordinary voyage that has ever been performed in the polar regions, *via* Davis Strait, in one season. Having the advantage of the experience of his predecessors, knowing where to go, and the probable difficulties from the ice, yet to have accomplished so much in one season proves him one of the most daring and skillful of Arctic navigators. It is in a sense no small triumph for engineering, for without the power of steam no ship could have done so much in so short a time. Capt. Adams has given previous proofs of his enterprise. It was with him that Captain Markham, R.N., made his "Whaling Voyage in the Arctic Regions," during which the Arctic rescued a portion of the ill-fated Polaris Expedition.—*Engineering.*

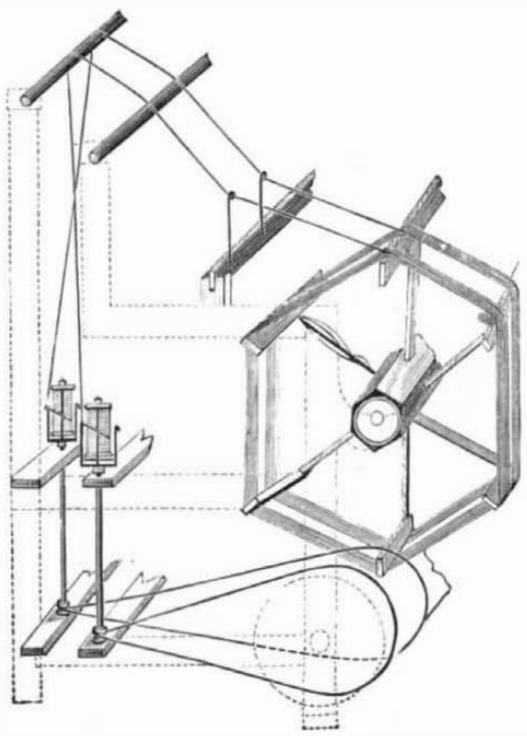
THE BIRTH RATE IN FRANCE.—The *Continental Gazette* notes that the birth rate in France is steadily diminishing; so is that of marriage, but in a lesser degree, the number of children resulting from these marriages having declined.

IMPROVED TWISTING REEL.

This machine, of which we present a perspective view in Fig. 1 and a section in Fig. 2, has been invented to simplify the process of twisting and reeling, which it successfully accomplishes by combining both operations in one machine. It is simple in its arrangement, and calls for little description on our part, nearly all the details being fully shown in the drawings.

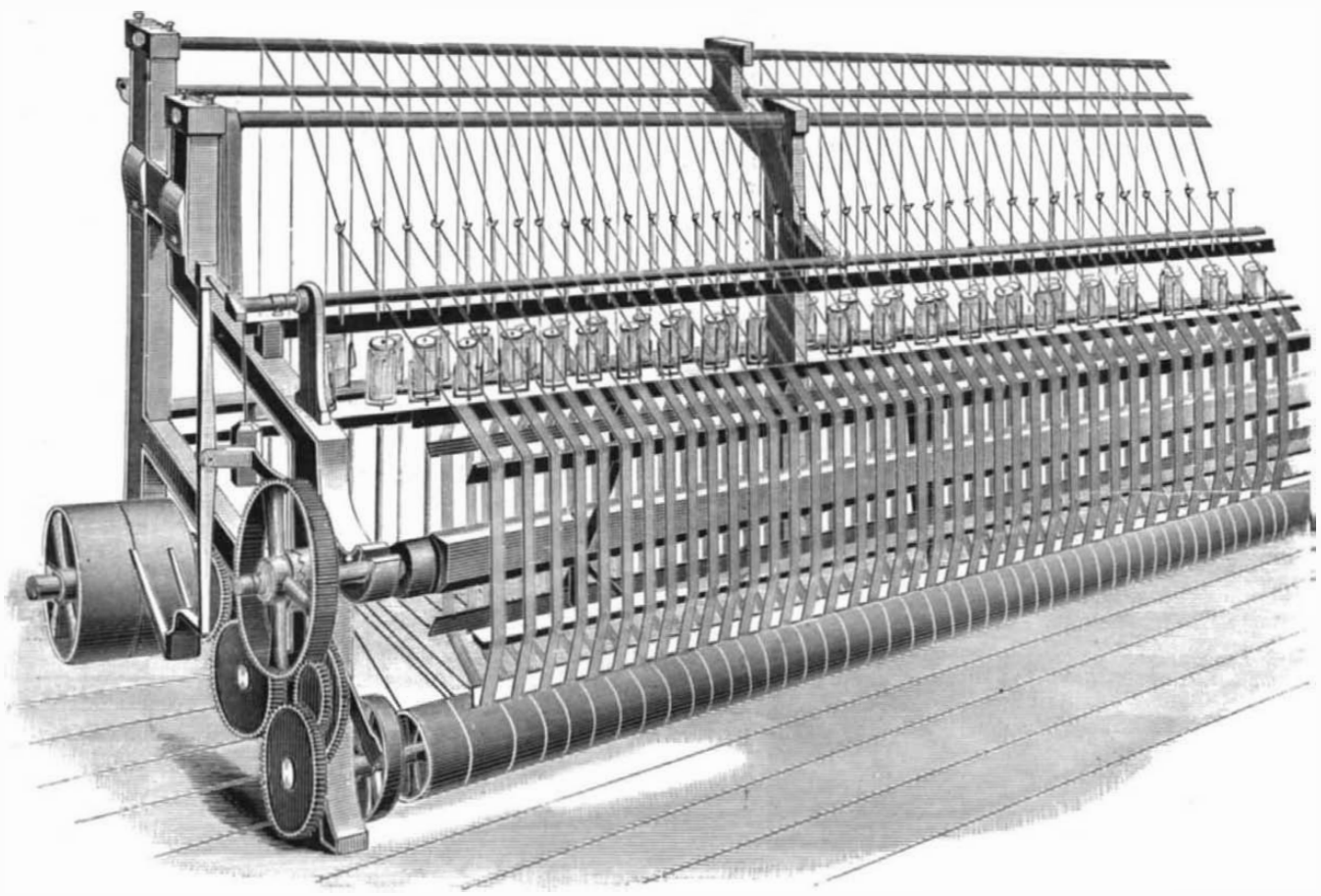
Mr. Thomas Unsworth, London, is the maker. Our engravings are from the *Textile Manufacturer*. The bobbins, instead of being mounted in a creel as usual, are placed upon the revolving spindles, and within the arms of inverted fliers, with which they are mounted. The doubled threads are then carried vertically upward and over the carrier rails, which bring them to the front of the machine.

Fig. 2.



Here, descending, they pass through guide wires, and are then attached to the reel. This reel is arranged so as to make several steps or movements in a lateral direction, by which means the hank can be subdivided into leas or any other required length with perfect ease.

Doffing is facilitated by the reel being made to collapse, and the attachment of an ingenious arrangement at the end of its axle, by which the doffing can be passed off with a minimum risk of staining the yarn with oil. The speed of the spindles and the reel is capable of being regulated in relation to each other, by means of a change wheel, one of the train shown in the illustration, so that more or less twist can be put in as may be desired. As will be gathered from the above, it is exceedingly simple, but though this is the case, it is said that it effects important economies.



UNSWORTH'S IMPROVED TWISTING REEL.

MECHANICAL INVENTIONS.

An improved carpenter's square, which will be found very useful to builders and others, has been patented by Mr. Jeremiah C. K. Howard, of Edgerton, Montana Territory. The invention consists of a carpenter's square containing a table for determining the length of rafters for pitches and spans of roofs, and a rule finding the length of rafters for spans of one-fourth, one-third, or one-half pitch. The square has columns of figures on it, divided by inch graduations, and representing the various pitches and spans of roof, arranged in such relation to each other as to indicate the length of rafters corresponding to each combination.

An automatic sampler for flour and other substances, the object of which is to facilitate the taking of samples at regular intervals of time, has been patented by Messrs. James S. Hillyer and George H. Hillyer, of Faribault, Minn. The invention consists in an automatic sampler, composed of a stationary cylinder having an upper receiving aperture in its side, a rotating interior cylinder provided with pockets, which are brought, one at a time, at regular intervals under the receiving aperture in the exterior cylinder, for reception of the flour or other samples, a spring driving and stop mechanism applied to the interior cylinder, and a stop bar, controlled by the hand of a clockwork, for liberating the interior cylinder to move the distance of a pocket at stated periods. By this device a mill superintendent will be furnished with samples on his return after an absence of work done, and in case of the stoppage of the mill, that fact will be made known to him, also the time when and for about how long the stoppage continued, so that he can fix the responsibility where due.

An improved treadle for sewing machines, lathes, and other purposes, capable of being more conveniently worked and with less strain on the operator than ordinary treadles, has been patented by Mr. Jonas Michael Hultqvist, of Stockholm, Sweden. This treadle has its footboard raised a short distance above its shaft, which latter is situated about one-third the length of the footboard from its heel end. It may be connected with its shaft by brackets, and is provided in front with an arm, projecting downward and outward, to which the rod for driving the crank is attached. By this construction of treadle the front of the foot is not required to be bent downward, thereby avoiding cramps, and, by depressing the heel part a very short distance only, a considerable stroke is obtained.

Mr. Horace L. Kingsley, of Racine, Wis., has patented an improved oscillating gear for platform spring wagons, the object of which is to prevent that twisting and straining of the gear and springs which usually results when the gear is rigid. In this improved gear, the center bar and the bar which rests thereon are hinged together by hooks or clips, and have a convex and concave bearing one upon the other. This effectually provides for the rocking of the upper one of said bars upon the lower one, thereby keeping the wagon bed level. The center bar, which is hung on the kingbolt, has a plate for the latter formed on it. A short bar permanently secured to crossbars, which are riveted or bolted to the bar that rests on the center piece, assists in forming a support for the wagon bed.

An improved releasing attachment for mechanical alarms, for use as a protection against burglars and in case of fire, etc., has been patented by Mr. Harvey A. Holloman, of White Rock, Texas. The invention consists in a wire attached to the anchor or escapement lever of a clockwork for ringing or sounding an alarm bell. This wire has a hook at its outer end, which is passed into a loop, ring, or hook at the end of a wire connected with the key-bolt or knob bolt of a lock, or with a wire leading to places a considerable distance from the alarm. The invention, which is very ingenious, admits of numerous modifications to adapt the alarm to different applications or places in which it may be used.

Messrs. Alfred Gurney and Robert H. Piper, of Newburyport, Mass., have patented an improved leather chamfering machine. The object of the invention is to facilitate the

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operation of chamfering the edges of shoe soles and promote accuracy in the work. The invention consists in a leather chamfering machine constructed of a stock faced with metal plates, an adjustably secured knife, a spring guard, also preferably made adjustable, for holding down the leather while being cut, and an adjustable gauge for regulating the depth of the chamfer. This gauge it is proposed to construct so that it can be set back when it is desired to chamfer the sole to a feather edge, and set forward when it is required to chamfer the sole to a square or mock-welt edge. By this machine the operator can chamfer the soles quickly and to any desired depth without nicking and spoiling the edges of the soles.

An improvement in grain binders, which exhibits great ingenuity and possesses more than ordinary merit, has been patented by Mr. Fredrick P. Rosback, of Springfield, Mo. The object of this invention is to facilitate the removal of cut grain from a harvester platform and the binding of the grain into bundles. The invention consists in providing the platform of a harvester with a hollow journal having a cavity of sufficient size to receive a gavel, a supporting drive wheel revolving upon the hollow journal and carrying the tying mechanism, and curved contracting flanges to guide the grain end foremost into the cavity of the said hollow journal; and also, in the combination, with the wheel and hollow journal, of a mechanism for carrying the cord around the gavel and holding the ends of the cord while the gavel is being tied, a mechanism for forming the knot loop, a mechanism for slipping the loop upon the cord and drawing the knot tight, and a mechanism for cutting off the ends of the cord.

Mr. George A. Bazé, of Havana, Cuba, has patented a very serviceable machine for shredding sugar cane. The object of this invention is to thoroughly tear apart and separate the fibers of sugar cane, and thereby reduce the latter to a condition which is best adapted for the extraction of its juices. Mounted upon a horizontal cylinder is a feeding hopper for the cane, provided with a lower inclined grating that projects into the cylinder. Within the cylinder are several series of hook-shaped knives arranged spirally around a revolving drum to which they are secured. These knives work between the bars of the grating and engage over the cane and break it down into the cylinder, where the cane is further subjected to the action of these knives and any number of adjustable radial knives arranged within the cylinder for the revolving knives to intermesh with. The knives not requiring to cut, but only to shred or tear, their edges should be left blunt.

North Carolina Gems.

Recently while mining for the new gem, hiddenite, Mr. Hidden struck a cavity which proved a perfect treasure house. The walls of the cavity were frosted with crystals, some of them of very large size. Among them were what are described as the finest emeralds ever discovered in the United States. They were nine in number, in color a clear grass green. The largest was eight and a half inches long, and had an average diameter of one inch; others were six inches, three inches, and two inches long. The largest emerald found in the mine previous to this last discovery was less than two inches in length and was not quite three-quarters of an inch in diameter.

The color of the emeralds found so far has not been quite satisfactory. They are clear, but more or less flawed and pitted, and have a succession of parallel lines drawn across the prismatic faces close together, and the basal plane is also often pitted with minute depressions. But crystals are rarely found pure with perfectly smooth and brilliant faces. The emerald color is often strongest on the surface, and fades gradually to a colorless central core. It is the belief, based upon experience of the output of the mine, that the color of the emeralds will improve as the mine is sunk deeper and deeper, and the results of the deep-rock mining are looked forward to with interest and high hopes by those interested in mineralogy.

Dassori's Safeguard.

We are rarely enabled to chronicle so rapid an introduction and so complete a success of a new invention as the above, which was patented through the SCIENTIFIC AMERICAN Patent Agency. The object of the invention is to prevent the shifting of grain cargoes in ships. It does away with the necessity of bagging the grain, and greatly promotes the safety of the vessel at sea. The improvement consists of an inwardly inclined ceiling arranged at the top of the hold of the ship.

The inclined ceiling prevents the loose grain from going into the wings of the vessel, and has the effect of throwing back the loose grain on the center of gravity of the vessel. It has been proved that all vessels having the safeguard arrived at their destination without the slightest list, although they had very severe weather and the cargo of many vessels had so settled in the hold that a man could easily walk over it. In the last two years a great number of vessels with the safeguard ceiling have crossed and recrossed the Atlantic laden with grain in bulk, and not one arrived with the cargo shifted, and by the avowal of the several masters three vessels at least, with their crews and cargo, have already been saved from total loss, which is the greatest satisfaction that the inventor could expect. Large numbers of vessels now use the improvement, and the principal insurance companies are warm in their praise of its advantages

Progress and Prospects of Cotton Milling in the South.

One of the fruits of the Atlanta Cotton Fair has been a greatly increased attention to the work that has been going on in the South, of late years, in the direction of cotton manufacture.

The hopeful expectations of those who have engaged in the work, with some of the more salient reasons for their hopefulness, have been discussed at great length by the correspondents of the daily papers, among them a very intelligent writer for the *Times*, who finds that manufacturing in the South is the one subject upon which men there speak with entire confidence. Most of them, he says, have some qualifying doubts as to agricultural progress, the cheapening of cotton production, the raising of home supplies, immigration, mining, and the many other new ambitions and enterprises which have engaged so much attention since the opening of this new era of industrial development. But concerning the future of manufactures, particularly of cotton, all men of intelligence and business experience speak with the assurance of inspired prophecy.

Some of the statistical grounds for this hopeful feeling are given below, and are worthy of consideration at this time.

"In 1860 there were but 159 mills, running 290,359 spindles and 6,713 looms, in the Southern States, out of a total for the whole Union of 1,091 mills, with 5,235,727 spindles and 126,313 looms. A fraction over 5½ per cent of the spindles were in the South. The census of 1880 gives a total of 10,921,147 spindles, of which 608,286 are in the South—still about 5½ per cent. In doubling the number of spindles in these twenty years, the South barely maintained its relative proportions. It employs now 18,223 operatives, against 163,405 employed in Northern mills; that is, for every operative in the South there are nine in the North. The era of growth in manufactures has only just opened in the South, however. The census of 1890 will greatly disappoint the people of this part of the country if it does not show that instead of a beggarly 5½ per cent of the manufacturing of the country the South has 20 or 25 per cent.

"The reasons set forth for this confidence are many and of unmistakable weight. At the outset every Southern man is sure to prove to you that it is a dead waste to ship raw cotton to a mill fifteen hundred miles away when it could be made into yarns or fabrics much cheaper in factories distant from the cotton field only a short half-day's journey for a mule. There is force in this reasoning. The money expended upon each bale of cotton in preparing it for and shipping it to the distant market makes a very considerable sum, which the manufacturer must deduct from the price of his raw material or add to the price of his product. Let us look at the items. Planters usually reckon that bagging and ties cost them nothing, as they are weighed with the bale and sell for as much as was paid for them. This reasoning is misleading, for the manufacturer reckons bagging and ties precisely as he does any other waste. These two items may be set down as $1. Then follow ginning and baling, $3; storage and insurance, 75 cents; drayage, 20 cents; samplings—say two pounds in all—20 cents; compressing, 75 cents; commissions and brokerage, $2; freight to New England and insurance, $5; waste by stealing, careless handling, dirt, storms, etc., not less than $3—in all, $14.90, or almost exactly the 1½ cents a pound which it is usually estimated that the New England manufacturer pays for his cotton above the price received by the grower. The aggregate of these charges upon the entire crop is something startling. The crop of 1879, according to the census returns, was 5,737,257 bales, of which Mr. Edward Atkinson's report shows that 195,389 bales were manufactured in the South. Upon the 5,541,868 remaining bales, presumably shifted to distant mills, the amount of these charges, at $14.90 per bale, was $82,573,823, which is really far below the true amount, for nearly three-fourths of the cotton which leaves the South goes to England, involving an additional expense of a cent or two per pound. $100,000,000 is not too small an estimate for the annual tax laid upon the cotton crop. The crop of 1879 was worth not far from $250,000,000, Two-fifths—40 per cent—of the South's income from its great staple, therefore, goes for baling, transportation, and the services of middlemen—things which add not a cent to the value of the product, and are made necessary only by the awkward fact that the plantations are from one thousand to three thousand miles from the factories. But the advantages are by no means confined to the elimination of unnecessary charges for baling and transportation. Power and labor are unquestionably cheaper in the South than in the North. The water power of the Southern States is almost without limit. The available power of Georgia's streams is reckoned at several million horse power. On an average it costs about $6 per horse power per annum for water to run mills in the South, while the steam for the Fall River mills costs $12 per horse power. The Augusta canal supplies water at $5 50 per horse power. This canal is 9 miles long, 150 feet wide, and 11 feet deep. The main canal, between the first level and the Savannah River, gives more than 14,000 horse power, of which only 1,900 are used. At Lowell, N. C., water power is offered free of charge to new mills. All over the two Carolinas and Georgia there are natural streams with ample fall for manufacturing purposes, and on many of these streams granite foundations for mills are to be had. The Southern water courses never freeze over nor do they dry up, droughts being much less frequent there than in the North; both ice and drought are recognized sources of loss in New England manufacturing. In another respect the climate of the South is more favorable for cotton manufacturing. The humidity of the Southern atmosphere is a very even quantity, from 65 to 70, a condition which is demanded for spinning and weaving cotton. In the drier Massachusetts air the manufacturer must employ steam to moisten the air and make the lint work smoothly. The Atlanta Cotton Mill, with 20,000 spindles, is run by steam, as Atlanta has no water power, though a canal which will bring the waters of the Chattahoochee to the city is projected. Coal costs here $3.25 per ton, but even at this disadvantage, as compared with the mills of Augusta and other neighboring cities, the Atlanta Cotton Mill, running night and day, clears $1,000 per week, or over twenty per cent profit on its capital of $250,000. There are, besides, a large number of other factories, flouring mills, etc., in Atlanta, all run by steam, but paying good returns on the capital invested, and new mills are building all the time."

In another letter, the same writer describes the practical working of certain representative Georgia and Carolina mills.

"In the city of Augusta about 80,000 spindles are now running. The Augusta mill has grown up around a small manufacturing property bought in 1858 for $140,000, to which the purchasing company added $60,000 for repairs and extensions. By stock dividends of two shares for one, the capital was subsequently increased to $600,000, and on this sum the mill has paid since the war dividends amounting to 226 per cent, or at the rate of 15 per cent per annum, and the money value of the property owned by the corporation is not less than $1,000,000. The mill now runs 24,200 spindles and 800 looms. It makes plain sheetings, drillings, and yarns Nos. 12 to 14. For the year ending June 30, 1878, the gross earnings of the mill were $130,447, and the expenses $56.878, allowing for quarterly dividends of 2 per cent, besides $25,000 carried to the surplus fund. The mill has never paid less than this. In 1880 it turned out 15,161,491 yards of sheetings and drillings, and paid four dividends amounting to $120,000—20 per cent on the capital stock. It has been pointed out—and the fact is exceedingly suggestive as showing the effect upon his profits of the saving which the Southern manufacturer makes in purchasing his raw material—that at the estimated saving of $7 per bale, compared with Northern mills, on the 11,819 bales of cotton used by the Augusta factory, in 1878, the stockholders realized $82,733, more than 63 per cent of their gross savings, without which the expenses of the mill would have exceeded its receipts by $9,164. The Langley Mill, at Augusta, was started in 1870, with a capital of $300,000, which was increased to $400,000 the next year. In 1872 the mill began work with 9,600 spindles and 300 looms. In the next five years it earned $293,725, exclusive of $25,000 paid out in interest. The net earnings for 1877 were 37,215; for 1878, $45,000; for 1879, $81,277. The total earnings for the eight years were $457,000. Add to this the amount paid out for interest on the borrowed capital, and the actual earnings come up to fully 15 per cent per annum on the $400,000 invested. The Vaucluse and Graniteville Mills, in Georgia, both owned by one corporation, earned $194,574 in 1880, and their expenditures were $51,045. After paying $18,000 in dividends, $125,000 was set aside for extending the mills.

"At Lowell, Gaston county, N. C., the Woodlawn and the Lawrence Manufacturing Companies, making cotton warps, Nos. 10 to 24, and yarns and sheetings, have paid dividends of from 12 to 15 per cent. These companies own a large tract of land, mostly improved, near Lowell, for which they are seeking settlers. There are now about 30,000 spindles run at Lowell, and water power is offered free to new mills. The Atlanta Cotton Mill, now in the hands of ex-Governor Bullock as receiver, not from pecuniary failure, but on account of disagreements among the stockholders and management, is running night and day, and earning dividends at the rate of 20 per cent. The factories I have selected for mention are not exceptional. The July dividends of the forty-five mills in Georgia were at the rate of from 10 to 35 per cent, and averaged fully 12 per cent. These facts show not only that manufacturing is a very profitable business in the South, thus giving an idea of the opportunities to be found here by the capitalist, but they prove that the Southern people have in their midst an unequaled field for the investment of their savings."

A California Enterprise.

Eagle Lake is located in Lassen County, Cal., 100 miles north of Reno, and near the projected course of the Nevada and Oregon Railroad. It is 30 miles long and 10 miles wide, and contains 116 miles of water surface. It has no known outlet. Marker and Merrill own the lake and many thousand acres of timber and farming land adjacent. They are now running a tunnel, which will be over 7,000 feet long, to tap the waters of the lake at a point 12 feet below its bed. When the lake is reached the fall of water obtained will be used to run a sawmill and flume, which will be built from the mill to Belfast, 26 miles distant. The timber cut in the mill and cordwood will be floated down the flume, and its waters will further be utilized for irrigating the thousands of acres near Belfast, which need but their fertilizing touch to swell with an abundant harvest. The timber around the shores of the lake is mostly spruce, yellow pine, and sugar pine. The trees are not as large in girth as those at the Truckee and Bigler woodlands, but are unusually tall and straight. The majority of the pine trees will yield four 16-foot logs before a limb is met.

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THE GREAT SUNFISH.

BY A. W. ROBERTS.

An unusual number and variety of tropical fishes and reptiles have visited our coast this season. In the turtle family we have had the green turtle, the shell turtle, the logger-head, and the huge leather turtle.

Of free swimming fishes taken by fishermen there has been the jew fish, gray snapper, tarpon, chætodons (angel fish), and great numbers of the balloon or porcupine fish, real man-eaters of sharks, and, the most odd-looking of all, the great sunfish (*Orthogoriscus mola*).

The specimen from which I made the accompanying illustration was captured at Oak Island Beach, about thirty miles from New York, on the Atlantic, last August, and was exhibited at Fulton Market Slip, New York. The color of the sunfish is grayish-brown, darker on the back than on the sides of the abdomen. The skin is rough, it being covered with minute patches of small spines.

One of the curious features of this fish is the structure of the eye, which is embedded in a mass of soft and flexible folds, while behind the eye is a sac filled with a gelatinous fluid.

When the sunfish is alarmed, or is basking on the surface of the water, the eye is pressed against the sac, and the fluid contained therein is forced into the folds of the membrane, which distends them so as to nearly conceal the organ of vision.

The sunfish is armed with two powerful teeth, with which it feeds on the coarser seaweeds found growing at the bottom of the shallower ocean waters, and also on the gulf-weed of the Gulf Stream. Some years ago I was sent to Greenport, L. I., to bring on a large living specimen of the sunfish. This specimen was confined in a pound or trap; when not disturbed it swam near the surface, with its huge dorsal fin entirely out of water. Its favorite food consisted of tubularians, sertularians, and ascidians, on which I constantly fed it.

The sunfish often attains a very great size. One that was caught in Florida, and sold to the New York Aquarium, measured six feet.

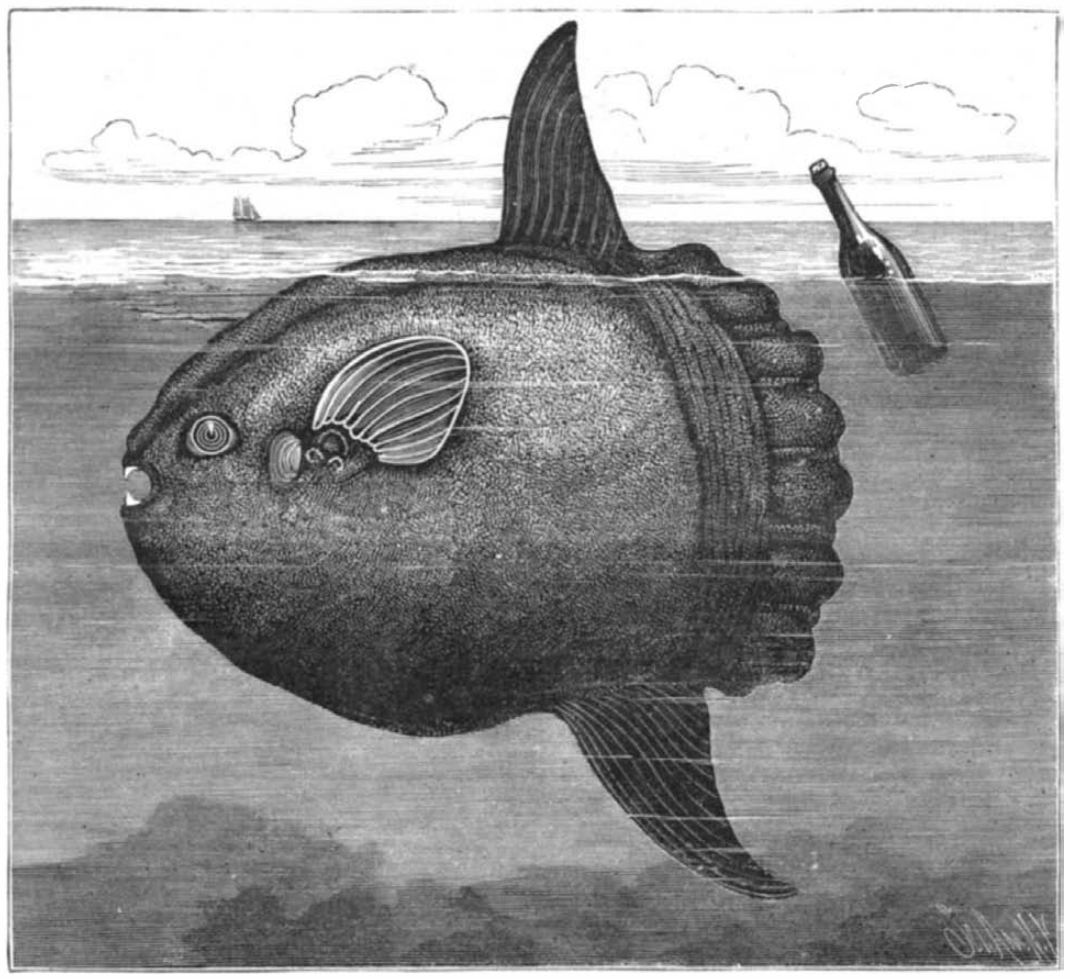
According to Yarrell, the young of the sunfish or head fish are furnished with several dull pearl-like teeth of various sizes situated in the lower jaw, some thin and flat, presenting an edge, others behind being cylindrical, short, and rather pointed. These disappear with age, for we learn from Jenyns that in the adult the lamellated substance is undivided.

Various parasitical animals, such as *Pennella*, *Sagitta*, and *Tristoma coccineum*, are found frequently adhering to the body.

The head of the sunfish is not distinct from the trunk, but suggests that the entire fish consists of a head only, thence the name head-fish. The form of the body is oblong, subtruncated behind, and compressed. The caudal, anal, and dorsal fins are confluent. The body is scaleless and destitute of lateral lines.

A fisherman relates that when trolling not long since for bluefish, he came across a sunfish as large as a hogshead, which was asleep on the surface of the water, with his huge dorsal fin entirely out of the water. At first he was well clubbed with an oar, but he didn't seem to mind it much. Then a couple of bights were made in the sheet rope, which were passed over his head, hoping that his fins would prevent their slipping, but it was no go. He opened his eyes as if awakening out of a sound nap, and went slowly under the water in a vertical direction, apparently only slightly disturbed. This specimen was estimated to weigh at least 800 pounds, and was much larger than the one exhibited at Fulton Market Slip.

The flesh of the sunfish is white, and as well flavored as that of the sturgeon. Its liver is large and yields considerable oil, which is greatly prized by sailors for its supposed medicinal qualities. The specimen from which the accompanying illustration was made measured four feet in length.



THE GREAT SUNFISH.

The Ruffed Grouse.—"The Drumming Log."

Having recent occasion to examine vol. xiv. of *Scribner's Monthly*, I came upon an illustrated article, August, 1877, No. 4, entitled "North American Grouse," and on page 419, the following old and familiar story of my boyhood days:

"In the breeding season the cocks select some hollow fallen tree, and strutting up and down, beat it with their wings, making a muffled drumming sound that can be heard half a mile. The beat is at irregular intervals, beginning slowly and measuredly, and gradually increasing in quickness, until it ends in a roll. If the bird succeeds in finding a dry log perfectly hollow and well placed, his tattoo of drumming several times, much to the amusement and gratification of his single auditor, so far as I was aware. The bird "strutted," it is true, not "up and down," but crosswise, much as the domesticated fowl do when they mount the topmost rail of their native barn-yard fence, flap their wings, and crow.

The domestic bird extends the wing more than the bird of the thicket, the latter seeming to elevate only the first joint next the body, the outer portion being extended but little beyond a vertical line, simply carried out from the body by the upward motion of the other part.

The whole outward movement for the first stroke is quite moderate, as are several of the succeeding ones in part, the wing apparently rebounding about half way, then extending moderately again, but "gradually increasing in quickness until it ends in a roll." The first and all of the inward motions are very spiteful. The wings neither touch the log nor the body. The force of the stroke is expended on the air alone.

In the cut, on same page with the quoted paragraph, the posture of the female is very good; that of the male unnatural. The head is set back too much by far. The tail is set up and forward too much.

The posture of the breast, body, and wing is that of the bird at the instant of springing from the side of the log to the ground beside his mate. In the act of drumming (if my memory serves me correctly) the tail is extended laterally, quite close to the log, not in a circular arch like a cock turkey, as shown in the cut; the head erect on neck, a little forward. My ears don't seem to detect the similarity between the drumming of the male grouse and the trilled whistle of the raccoon.

The drumming is not confined to the breeding season, though it is not often heard in July and August, but in the warm, clear, beautiful sunny days of September and first of October, this, "one of the pleasantest of woodland sounds," is often heard; certainly so this season. These birds are not confined to logs either, I am sure, but have no doubt they drum on stumps, stones, and even on the ground, sometimes by moonlight. DE CÄJÄH.

Curious Specimens of Southern Woods.

One of the notable exhibits at the Cotton Fair is a fine display of Southern woods, both rough and polished. It includes the sweet gum (*Liquidamber styraciflua*), a light colored wood, often worked up for coffins; the tupelo, or sour gum (*Nyssa multiflora*), a tree that cuts like cheese, but cannot be split, used by the negroes for corks; the palmetto (*Sabal palmetto*); the Spanish bayonet, with stiff blades sharp as needles and serrated edges; the swamp cypress (*Taxodium distichum*), with its pointed excrescences three feet high springing from the root; and the curled pine, which takes a grain polish like the curled maple, but infinitely more vivid and beautiful. The Georgia sawmills—there are eight hundred of them in the State—have sent in some colossal pine logs, one of them a sylvan monarch, straight as a needle, seventy feet long, twenty inches in diameter at the smaller butt, and some four feet thick at the base.

Whales Cut in Two by a Steamer.

The steamship Newport, of Ward's Line, had an unusual experience during a recent outward trip to Havana. She sailed from this port on Thursday, October 27, and before daylight next morning she was off the Capes of Delaware. At about 8 o'clock, when she was steaming at the rate of fifteen miles per hour, she ran into an immense school of whales twenty miles long and a quarter of a mile wide. The animals were of all sizes, and disported themselves in the water as if enjoying it. Suddenly the ship shook from stem to stern, as she struck a monster about sixty feet long, which was attempting to cross her path. The whale was cut in halves, which passed astern on either side, while the water was dyed red with his blood, The steamer came to a standstill, and her stem was examined. It was found to have escaped injury, but the steering gear was slightly damaged. This was soon repaired, and the Newport proceeded, but the passengers were not so delighted with the whales as they had been before the shock. The sight of the monster's head as it shot upward from the water had been anything but pleasant to them. Ten minutes after the vessel started up there was another and a heavier shock, which almost threw the passengers from their feet. Another whale had been cut in two. The body of this animal passed under the vessel and struck the propeller with great violence. The engineer rushed on deck, imagining that the ship had struck a submerged wreck. Capt. Sundberg ordered the course of the steamer changed, and she soon ran out of the troublesome whales.

Sweet-Flag Candy.

Sweet-flag candy is relished by all lovers of sweetmeats, and it is a valuable aid to digestion, as it will stop the disagreeable rising of gas, so annoying to dyspeptics. Being eaten greedily by children, it is often better than other medicine. A bit held in the mouth when one is caring for the sick will often counteract the effect of contagious germs. To prepare it, take fresh, healthy roots of sweet-flag, and after a careful washing, cut in slices one-eighth of an inch in thickness. Put them into a stewpan or bright basin, and pour a little more cold water over them than will cover them. Set on the stove and heat slowly; when the water boils turn it off. If the candy is desired for medicine, quite enough of the strength has been removed, but for a sweetmeat it is better if boiled up and the water turned off four or five times. Now measure the sliced roots, and to each two cupfuls allow one and a half cupfuls of white sugar, turn on water enough to cover, return to the stove and simmer slowly, stirring often until the water has quite boiled away; then turn out on buttered plates, and stir frequently until dry. The long simmering after the sugar is added makes the roots quite tender, and the candy will keep fresh and nice for years.—*Country Gentleman.*

Injunction against Hydraulic Mining.

The controversy between the citizens of Marysville, California, and the surrounding agricultural country and the hydraulic mines in the foot-hills above, has resulted in an order of Judge Mayhew, of the Superior Court at Marysville, enjoining all miners from further operations.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

THE SINGER MANUFACTURING COMPANY'S
CASE FACTORY,
SOUTH BEND, Ind., November 4, 1881.

H. W. Johns Manufacturing Company, New York.

GENTLEMEN: Some of your Asbestos Roofing was used to cover our dry kilns during 1879, and at this date is in good order. The under side of the roof is exposed to steam and acid generated in drying lumber, and a temperature of 250° heat; while the roof rafters and sheathing have cracked by the heat, your roofing shows no sign of damage.

Tin roofs, painted both sides, used to last but a few months, while the ordinary gravel roofs are useless on our kilns. Yours very truly, THE SINGER M'F'G CO.,
L. PINE, Supt.

New York Assay Laboratory, Thos. B. Stillman & Co., 40 Broadway and 53 New St., New York. Send for descriptive circular.

Prepare to save your apple crop this year. By the use of Boomer & Boschert's Cider Press more money can be realized from your orchard than from all the rest of your farm. Send for illustrated circular, with prices, which are unusually low. 15 Park Row, New York.

Garmore's Artificial Ear Drums, an appliance for the relief of partial or entire deafness, invented by one who has been deaf thirty years. Simple and scientific in construction, and not observable when in use. Send for circular. Jno. Garmore, S. W. Cor. 5th and Race Sts., Cincinnati, Ohio.

A Valuable Christmas Present.—Volumes of the *Manufacturer and Builder*, for any year since 1869, beautifully bound, $2.50 each, postpaid; or complete set, from 1869 to 1880, inclusive, for $27. Address H. N. Black, 37 Park Row, New York.

Workshop Receipts.—A reliable Handbook for Manufacturers and Mechanics. $2, mail free. Ornamental Penman and Signwriter's Pocketbook of Alphabets. 20 cents. E. & F. N. Spon, 446 Broome St., New York.

For Sale.—Patent on Ice Machines. W. J. Lyons, Decherd, Tenn.

Wanted—Situation by Gold, Silver, and Nickel Plater; 22 years' experience. Address Plater, Oakville, Conn.

Engines purchased for cash or advances made on consignments. E. E. Roberts, 107 Liberty St., N. Y.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Portable Power Drills. See Stow Shaft adv., p. 348.

Mailed free. Catalogue of Books for Engineers. Theoretical and Practical. E. & F. N. Spon, 446 Broome St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Completed and ready for shipment to purchaser, one of our celebrated Milling Machines. Weight, about 1,200 pounds. George S. Lincoln & Co., Phœnix Iron Works, 60 Arch St., Hartford, Conn.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

For Sale.—A complete set of Patterns, Flasks, and Core Arbors, for making Cast Iron Flanged Pipe, Elbows, Tees, and Greenhouse Fittings. Will be sold low to clean out a branch of a business. Address C., Box 1358, New York.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

Foot Lathes, Fret Saws, 6c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses. $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 301.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 107 Liberty St., New York. Communicate.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

4 to 40 H P. Steam Engines. See adv. p. 318.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Peck's Patent Drop Press. See adv., page 333.

Learn Telegraphy. Outfit complete, $4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Saw Mill Machinery. Stearns Mfg. Co. See p. 333.

Cope & Maxwell M'f'g Co.'s Pump adv., page 334.

The American Electric Co. and Proprietors and Manufacturers of the Thomson Houston System of Electric Lighting of the Arc Style. New Britain, Conn.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 332.

Supplee Steam Engine. See adv. p. 270.

See Bentel, Margedant & Co.'s adv., page 349.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Clark & Heald Machine Co. See adv., p. 350.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 350.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 350.

Peerless Colors for Mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 349.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Safety Boilers. See Harrison Boiler Works adv., p. 349.

The Medart Pat. Wrought Rim Pulley. See adv., p. 349.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 349.

Engines, 10 to 50 H. P., $250 to $500. See adv., p. 350.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 349.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 348.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 340.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 350.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phila. P.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 349. Totten & Co., Pittsburg.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) D. S. asks: 1. Are not the steel tires of locomotive driving wheels put on by means of shrinking? A. Yes. 2. I have read a number of times of the sudden rupture of the tire on a drive wheel. Now, if my first question is answered in the affirmative, may not the rupturing of the tires be due largely to the strain on the tire caused by shrinking it on to a rigid wheel? A. If the work is properly done, the shrinking should not rupture the tire. 3. If shrinking on the tire has a tendency to weaken the same, why do not the builders of locomotives adopt some means of setting the tires of the drive wheels so that there will be no strain on the said tires? A. Because there is no known method of fastening which would bind the tire to the wheel with sufficient firmness.

(2) E. A. asks: Will you be kind enough to give me a good recipe how to bleach bones? A. Dip the bones for a few moments in a boiling solution of one pound caustic soda in a gallon of water, then rinse thoroughly in water, rub down with fine pumice stone, and expose until whitened, to the vapor of burning sulphur largely diluted with air, then rinse in warm water. Bones may also be whitened by exposure in a weak solution of javelle water.

(3) D. B. & Co. ask: Can you inform us how to make javelle water? A. Javelle water proper is prepared by passing gaseous chlorine—derived from the action of hot sulphuric acid on a mixture of common salt and oxide of manganese—into a ten per cent aqueous solution of carbonate of potash until the latter will absorb no more. It may also be made by adding a solution of carbonate of potash to a solution of chlorinated lime (bleaching powder) as long as a precipitate continues to form, the liquid being afterward decanted or filtered. Ordinarily, however, the liquid called javelle water is chlorinated soda and not potassa. This liquid, also known as Labarraque's disinfectant, is prepared by dissolving 12 oz. (avoir.) of soda crystals in 1 quart (imperial), and saturate with chlorine gas evolved from 3 oz. of black oxide of manganese, 4 oz. common salt, and 2½ fl. oz. of sulphuric acid diluted with 3 fl. oz. of water by aid of heat in a retort. A readier way of making the solution for ordinary purposes consists in mixing a solution of ½ lb. good lime chloride in 3 pints of water with 7 oz. carbonate of soda (crystals) in 1 pint of water—drawing off the clear liquid after the mixture has settled. Glauber salt (sulphate of soda) may be used instead of part of the carbonate; with this the proportion may be 5 lb. bleaching powder, 10 lb. sulphate of soda, 4 lb. sal-soda, and 4 pails of water, well mixed. Sulphate of lime deposits from this liquid.

(4) J. W. S. asks: Can you oblige me by answering through your column of Notes and Queries the following questions? 1. I should like a good receipt for taking out blots and ink stains from writing paper. I have tried a mixture of acetic acid with solution of chloride of lime, but after a week or two it is of no account, owing, I suppose, to the loss of the chlorine gas which, I suppose, gives it its value when freshly prepared. A. We know of no good preparation for this purpose that can be kept for any length of time. The preparation mentioned is about as good as any. Have you tried dilute aqueous solution of peroxide of hydrogen? 2. Can you give me any good method of toughening the edges of pasteboard, say for about half an inch from the edge, so that it will not be easily cut by a small cord when drawn tightly over it? Can it be treated the same as tissue paper with sulphuric acid, or would there be difficulty in washing the acid from the pasteboard? A. Sulphuric acid cannot be employed advantageously. Try listing the boards in a hot sirupy solution of zinc chloride and then in sal-soda solution. 3. Can you give me the name of any substance which I can mix with white sand so as to keep white marble steps up to the "Quaker City" standard of whiteness with a little less muscular exertion than has to be bestowed upon them in the ordinary way of cleaning? A. A stiff wire brush greatly facilitates the cleaning. Oxalic acid (dilute aqueous solution) is frequently used in connection with sand, but it gradually rots and wears away the stone.

(5) P. W. asks: Will you please inform me the process or how to mix for marblizing either wood or iron? I think I am pretty near right. I have mixed my colors in boiled linseed oil, but a great quantity of the color settles or goes to the bottom of the water. A. See Marbling on Paper, etc., in SUPPLEMENT, No. 119.

(6) H. M. R. asks: Please give a formula for making a cement which will adhere to glass and stand water heated to 140° Fah. I have a number of bath tubs lined with plates of thick glass, and find it difficult to get a cement which will not soften or crack by the hot water. A. Try marine glue. See Cements, page 2510, SUPPLEMENT, No. 158.

(7) C. G. B. asks: Is there any process whereby newly made bread, cake, etc., can be hermetically sealed up so as to keep for an indefinite length of time? A. Bread or cake could not be sealed as proposed so as to remain sweet or unchanged for any length of time.

(8) J. A. P. writes: 1. I wish to experiment for a special purpose with static electricity. Can I produce this electricity by friction on hard rubber with chamois leather or wool pads? If so, will it be necessary to use amalgam on the cushions? A. In cold weather you can use a Holtz electrical machine to great advantage in producing static electricity. In damp weather use an induction coil. You can generate a small quantity by using friction of a wool or silk pad on rubber disk. Sulphide of tin, in powder, should be put on the pad. 2. Which is the best form for the rubber, disk or cylinder? A. A disk. 3. Can the electricity be collected or taken off by points same as in plate glass machines? A. Yes. 4. What would be the best size for disk or cylinder? A. It depends altogether on the quantity of electricity required. 5. Is there any better method of producing static electricity than the above? A. See answer to first query.

(9) O. H. B. asks: Can you inform me how to produce a good finish (gloss and stiffness) on collars, cuffs, and shirt bosoms? I have tried gum arabic, gelatine, and white glue, but with no satisfaction. A. Put the fabric through a pretty stiff clear boiled starch, dry and dampen with the following: Fine raw starch, 1 oz.; gum arabic, ¼ oz.; water, 1 pint; heat the water to dissolve the gum, let it cool, stir in the starch, and add the white of one egg. Beat well together before using. Apply lightly with a sponge, and use a polishing iron to properly develop the gloss.

(10) W. J. N. asks: How can I avoid the smoking and fuming of the acid in dipping small brass articles preparatory to plating them? The shape of the articles is such as not to allow the acid to run off from them readily. The dipping must render the brass not only clean but bright and shiny. I have used for the purpose a mixture of equal parts of nitric and sulphuric acids with a little muriatic acid added. Will any other acid or mixture of acids do the same work without producing the fumes and smoke? A. The production of fumes by the acids cannot be obviated. The dipping is usually performed under close hoods connected with a chimney having a good draught. A strong aqueous solution of potassium cyanide can in some cases be advantageously substituted for the acid dip.

(11) A. P. asks: Is there any process by which a tent, made of light drilling, can be rendered perfectly waterproof, and, if possible, fireproof? A. See Waterproofing, page 74, vol. xliv. Sulphate of ammonia (crude) added to the rinse water will render the goods non-inflammable.

(12) E. J. O. writes. The streams here contain quite pretty pearl shells. How can I remove the dark or outside portion without injuring the pearl? A. It is generally removed by grinding and polishing. An ordinary grindstone will remove it. Powdered pumice stone will smooth the shells, and they can be polished with rotten stone.

(13) W. R. says: Three of us (steam fitters) have had a dispute, and could not agree as to who was right; so we decided to ask you for advice. The question is, what is the proper way to bend ordinary pipe? I say the seam should be on the inside of the bend. A says the seam should be on the outside. B says the seam should be at the *side* of the bend. A. B is right. The pipe will be less likely to split in bending by his plan.

(14) F. H. S. asks: Can you inform me of a preparation of acid that will brighten tarnished brass by simply dipping the brass into the acid liquid and then rinsing it in water? A. A bath composed of nitric acid mixed with an equal volume of water is used for this purpose. The brass must not remain more than a few moments in the dip, and should be well rinsed in running water immediately after removing from the acid liquid.

(15) O. H. T. writes: I have an induction coil the primary coil of which is composed of three layers (the spool is 6 inches long) of insulated copper wire, No. 14; the secondary coil is made of No. 30 insulated copper wire; there are a little more than two pounds of the latter. What have I gained or lost by the extra layer in the primary coil? A. You have lost some of the effect of the magnetism of the core on the finer wire of your coil; but on the other hand you have gained something by having a longer primary wire. Four layers of No. 18 would be appropriate for a coil of the size given. 2. Have I used too much wire in my secondary coil? A. No; but the same length of No. 36 wire would be more effective, since the outer layer would be nearer the primary and its core. 3. How much tin foil must I use to get the best effect? A. About ten square feet. 4. What is a Grenet battery cell, and how charged? A. See SUPPLEMENTS, No. 157, 158, 159, for information on batteries. 5. Why is platinum used where the current is broken by the vibrator? A. Because it is least affected by the discharge of the extra current.

(16) O. H. M. writes: 1. I have a small engine that I run a part of the time during the day, and as I have some surplus power, would it be practical for me to run a small dynamo electric machine during the day, and charge a secondary Plante battery, so that I could use from one to three of the Edison or some similar light during the evening? My room or store is about 50 feet by 20 feet. A. It would depend upon the size of engine and dynamo, also upon the size of the secondary battery. With these things properly proportioned to each other, and to the number of lamps to be used, it is possible to accomplish what you propose. 2. Is there any better or improved form for the secondary battery than that illustrated on page 406, vol. xliv., No. 26? The battery referred to answers very well, but the canton flannel is soon destroyed by the acid. Felt and woolen flannel has been used with good results, but even this is destroyed after a time. As to convenience and capacity the battery referred to is probably superior to the Plante. 3. The probable cost of a battery sufficient for the above if practical? A. This depends upon whether you make it yourself, and also upon the cost of materials in your locality. We do not know of a battery of this kind in market.

(17) G. R. B. asks: Can you inform me if the engine illustrated in SUPPLEMENT No. 279 would be double the power by using two cylinders and placing balance wheel in center of shaft? A. Yes. 2. Would it be powerful enough to run a small boat, say about eighteen feet long? A. Hardly. Its size should be doubled. 3. Would a coil of pipe be better than boiler, described in No. 182 SUPPLEMENT. A. The flask boiler would be the best for an engine of that size. 4. Are there any small editions of United States Patent Laws, in condensed form, I can get for information on the subject? A. The SCIENTIFIC AMERICAN REFERENCE BOOK contains the information you want.

(18) J. S. G. says I have been a long time trying to get something to put in a glass case where cutlery is kept to keep it from rusting, but so far have not succeeded very well. Can you inform me what is the best thing for such a purpose? A. Put in the case a small dish of powdered quicklime, or good calcium chloride, in small lumps, and keep the case closed tightly as much as possible.

(19) F. E. K. asks: What materials can I use to make a lining to a fire box in a stove, to be applied in a plastic state to take the place of the ordinary fire brick and to become hard on standing? A. Mix intimately good fire clay with one-fourth its weight of clear fine quartz sand and water enough to make a thick paste. It should be allowed to dry slowly (and thoroughly) before heating. Heat slowly at first.

(20) T. H. J. asks: Will you please give or refer to information as to ozone, viz.: Will ozone kill the germs or sporules of mould and ferment? A. Yes, if present in sufficient quantity. 2. Can it be used successfully in preventing decomposition of animal or vegetable substances? If ozone were mixed with fluid extracts or decoctions, would they keep good? A. No. Ozone can not be used fully employed as an antiseptic, though it is a very good disinfectant.

(21) W. J. W. asks: Is potato flour manufactured in America, and to what extent and where? What is its worth in English markets? A. Potato flour (potato starch) is largely manufactured in this country. See "A Technical Treatise on Starch." Address the booksellers who advertise in this paper.

(22) S. H. C. writes: Please let me know what chemicals are used on paper that a current of electricity will stain or mark on? A. Saturate the paper with a strong aqueous solution of ferrocyanide of potassium or of iodide of potassium with a little starch.

(23) W. J. T. asks: Which will stand the fire best: the hard or soft cast iron? A. The latter.

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MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. L.—It is partly altered mica schist—of no commercial value.—T. F. W.—A green stone containing much magnetic sulphide of iron—pyrrhotine—probably carrying a little nickel.—M. M.—It is niter—potassium nitrate —G K.—It is crystallized sulphide of iron, pyrite. —L. J.—Quartzite with argentiferous galena—silver bearing lead ore.

COMMUNICATIONS RECEIVED.

On a Shock of Earthquake. By. E. W. B.

On Zinc and Copper Ores in Maine. By F. L. B.

NEW BOOKS AND PUBLICATIONS.

N. W. AYER & SON'S AMERICAN NEWSPAPER ANNUAL. 1881.

Contains a carefully prepared list of all newspapers and periodicals in the United States and Canada, arranged by States in geographical sections and by towns in alphabetical order; the name of the paper, the issue, general characteristics, year of establishment, size, circulation, and advertising rates. Its reports of the population of the country are very full and complete, including that of States, counties, and county seats. It also gives the political majorities and the greenback vote of States and counties at the Presidential election of 1880. A tabulated statement of newspapers is given on page 14. A description of every county in the United States, as well as of each State and Territory as a whole, and of the Canadian Provinces, giving valuable information concerning their mineral deposits.chief agricultural products, principal manufactures, nature of the surface and soil, area, location, etc. It is a volume from which information of the most varied use and importance can be obtained. Newspapers can only flourish in the midst of free, industrions and intelligent peoples. Here are specified and described more than nine thousand different American periodicals. It is a catalogue of national greatness and power. Published by N. W. Ayer & Son, Philadelphia, Pa.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 1, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adjustable table and book support, C. D. Stitt... 248,894
Animal shears, A. Ridgway... 248,952
Apparel, fastening for wearing, F. A. Smith, Jr... 248,893
Atomizer and syringe, combined, S. W. Beall... 248,983
Auger, P. A. Gladwin... 248,854
Banjo, L. Anderson... 248,979
Bar. See Pinch bar. Pitman bar. Saddle bar.
Bath. See Shower bath.
Bed bottom, C. T. Segar... 249,108
Bed bottom, spring, E. S. Field (r)... 9,919, 9,920
Bed lounge, O. Stechhan... 248,959
Bed plate and spiral spring, C. W. Pratt... 249,090
Belt, galvanic, L. D. McIntosh... 249,070
Bit. See Bridle bit.
Blower, fan, J. W. Anderson... 248,978
Boiler furnace, J. Elliott... 248,925
Boiler furnace, steam, J. Johnson... 248,864
Bolt, J. C. Clime... 248,847
Boneblack, art of and apparatus for making and revivifying, R. A. Chesebrough... 249,004
Boot and shoe sole and heel, J. Pienovi... 249,086
Boot and shoe sole channels, mechanism for closing, W. B. Arnold... 248,836
Boot brushing machine, A. S. Clark... 249,006
Bottle filler, P. Saal... 248,886
Bottle stopper, G. Havell... 249,043
Bottle stopper, J. G. Hirsch... 248,861
Box. See Feed box.
Brake. See Car brake.
Bricks, shed for drying, J. Evans... 249,144
Bridge, H. C. Groves... 249,038
Bridle bit, J. Stanley... 249,113
Button, W. Hornich... 249,048
Button or stud, C. E. Westcott... 248,967
Calendar, R. McCurdy... 248,872
Can. See Oil can.
Canopy standard, J. H. Sanderson... 248,955
Car brake, W. B. Guernsey... 249,039
Car brake pawl, T. C. Ralston... 248,883
Car coupling, J. Cochran, Jr... 249,007
Car coupling, H. Gladwin... 248,853
Car coupling, J. W. Hancock... 249,040
Car coupling, J. Kelley... 249,059
Car coupling, T. R. Morgan *et al.*... 249,075
Car door, freight, C. A. Smith... 248,891
Car draught and buffing apparatus, F. W. Marston 248,940
Car heating apparatus, freight, Eastman, Kimball & Murch... 248,924
Car roof, H. Aldridge... 248,905
Car seat, G. Merz, Jr... 249,072
Car, sleeping, J. Christiansen... 248,915
Car, sleeping, G. Clarke... 248,846
Car wheel, J. K. Sax... 249,102
Car wheel fender, railway, J. G. Schiller... 249,104
Carbureting apparatus, air, H. Cottrell... 249,013
Carriage top prop, L. Sawyer... 248,887
Carrier. See Egg and fruit carrier.
Cartridge implement, S. Baker... 248,837
Case. See Show case.
Cask stopper, C. A. Raggio... 248,882
Chair. See Rocking chair.
Chair or stool, I. R. Gilbert... 249,035
Chandelier, extension, F. A. Johnson... 249,057
Chopper. See Cotton chopper.
Cigar coloring machine, N. Du Brul... 249,029
Cigar cutter, C. Du Brul... 249,028
Clamp. See Woodworker's clamp.
Clasp. See Garment clasp.
Clasp, I. V. Ford... 249,032
Cleaner. See Grain cleaner.
Clip. See Yoke clip.
Clock works, support for, J. J. Vossler... 249,125
Clocks, device for adjusting the beat of pendulum, J. G. & J. R. Watts... 248,900
Clocks, striking mechanism of repeating, C. S. Lewis... 248,935
Clover hulling machine, H. Löhnert... 248,937
Clutch device, J. B. Secor... 248,889
Cock, alcohol, C. C. Mulford... 249,077
Coffee and spice mill, M. W. Shafer... 249,110
Coffee making apparatus, W. G. Petry... 249,084
Coffee mill, T. Weaver *et al.*... 249,127
Coffee roaster, G. A. Beidler... 248,986
Coffin handle, J. Johnson... 248,865
Collar supporter, shirt, P. M. Griffin... 248,856
Coloring matter, production of, O. N. Witt... 249,136
Condensing apparatus, B. T. Babbitt... 248,981
Cooler. See Milk cooler.
Corn sheller, C. C. Burroughs (r)... 9,918
Corset, T. F. Hamilton (r)... 9,917
Cotton chopper and scraper, combined, J. C. McCaskill... 248,871
Coupling. See Car coupling.
Crayon, C. A. Catlin... 248,845
Cultivator, G. W. Brown... 248,991, 248,992
Cultivator, Brown & Holyoke... 248,993
Cultivator, C. M. Risley... 248,954
Cup. See Drinking cup.
Cushion. See Sewing cushion. Window cushion.
Cutter. See Cigar cutter. Stalk cutter.
Cutter head for rounding fellies, J. C. Tunnicliff... 249,121
Cutting circular objects, machine for, M. Cilik... 248,916
Dams, wicket and caisson for movable, W. H. Dechant... 249,024
Dental engine, P. Shaw... 249,111
Dental tool holder, E. T. Starr... 248,958
Derrick, hydraulic, O. M. Loveridge... 248,938
Disintegrating apparatus, C. Déschamp... 248,923
Disintegrator and strainer, C. F. Heals... 248,930
Door, storm and screen, G. Huffman... 249,050
Draughting instrument, C. R. Howard... 249,049
Drier. See Grain drier.
Drill. See Mining drill. Rock drill.
Drills, feeding diamond or other rotary, Ball & Case... 248,982
Drilling machine, H. H. Chapman... 248,913
Drinking cup or glass, G. H. Lomax... 248,867
Dyeing aniline black upon cotton, J. J. Leloir... 248,934
Ears and inserting earrings, apparatus for piercing, J. J. Greenough... 248,855
Edge iron and handle, H. P. Roberts... 249,096
Egg and fruit carrier, L. H. Page... 248,947
Egg beater, E. D. Hawkins... 249,044
Electric machine, dynamo, J. A. L. Craig... 249,017
Electric signaling apparatus, T. D. Lockwood... 249,147
Electric switch and clock system, combined, C. E. Buell... 248,995
Elevator. See Hay elevator. Hydraulic elevator.
Elevator, Behrns & Unruh... 248,985
Elevator, J. Falk... 248,851
Elevator stop, D. Moulton... 249,076
Engine. See Dental engine.
Farm gate, A. S. W. Timmons... 248,964
Faucet, G. W. Hilliard... 249,046
Faucet, C. Whittaker... 248,970, 248,971
Faucet, measuring, F. T. Williams... 249,134
Feed box for animals, automatic, Blaisdell & Wright... 248,909
Feed water heater for locomotives, M. Zeck... 249,137
Fence, R. Donaldson... 249,027
Fence barb, W. W. Butler... 248,999
Fence, hedge, S. K. Rahn... 248,950
Fence, iron, S. W. Martin... 249,066, 249,067
Fender. See Car wheel fender.
Fertilizer distributer, Rea & Robinson... 249,093
File grinding machine, C. D. Miller... 248,874
Filter, J. Toland... 248,897
Finger nail trimmer, Heim & Matz (r)... 9,921
Finger supporting and exercising device, B. Atkins... 248,980
Fire kindler, R. A. Eddy... 248,849
Forceps, obstetric, A. Miller... 249,073
Form, dummy, J. A. Gillotte... 249,036
Frame. See Mosquito bar frame.
Fruit jar, G. F. Littlejohn... 248,866
Furnace. See Boiler furnace. Roasting furnace.
Game table, J. Lechner... 248,933
Garment clasp, J. P. Lindsay... 248,936
Garment stretcher and former, J. A. Johnston... 249,058
Gas by admixture of hydrocarbon vapors, apparatus for enriching, J. Livesey... 249,063
Gas extinguisher, D. Davis... 249,021
Gate. See Farm gate. Railway safety date.
Glove, etc., spring, Fidoe & Radford... 248,852
Glucose or grape sugar, manufacturing, Williams & Alberger... 248,972
Governor, steam engine, C. H. Powers... 248,881
Governor, steam engine, Z. C. Talbot... 248,961
Grain cleaner, J. P. Bond... 249,141
Grain drier, steam, H. Coker... 249,009
Grain separator, W. H. Janney... 249,055
Grinding mill, R. Schneider... 249,106
Grinding mills, dust collector for, S. L. Bean... 248,984
Guard. See Key hole guard.
Gum substitute, Wilson & O'Reilly... 248,904
Handle. See Coffin handle.
Harness, line guide for, P. Schneider... 249,105
Harrow, A. C. Evans... 248,850
Harrow tooth holder, Baker & Sweetland... 248,907
Harvesting machine, W. N. Whiteley... 248,969
Hat stretcher, J. Tobias... 249,118
Hay elevator and carrier, L. E. Miles... 248,873
Heat generating process and apparatus, G. Reis... 249,094
Heater. See Feed water heater.
Heating buildings, apparatus for, J. F. Pease... 248,948
Heel burnishing machine, M. A. Tyler... 248,965
Hides, machine for working, fleshing, and unhairing, C. H. Taylor... 249,114
Holder. See Dental tool holder. Harrow tooth holder. Oil cup holder. Rein holder.
Hook. See Safety hook.
Hoop. See Toy chime hoop.
Horse detacher, Holden & Gorham... 248,931
Horse power, C. H. Baker... 248,906
Horses, device for stopping, G. Villar... 249,123
Hub and lubricator, wheel, B. H. Kemble... 249,060
Hydraulic elevator, C. W. Baldwin... 248,908
Hydraulic and steam motors, valve apparatus for, C. Roux... 249,150
Indicator. See Station indicator.
Insect destroyer, J. Bowers... 248,844
Iron. See Edge iron. Soldering iron.
Jar. See Fruit jar.
Key hole guard, A. E. Voos... 249,124
Knitting machine, F. A. Calley... 249,000
Lamp and timepiece, combined, J. Bell... 248,987
Lamp, electric, J. A. L. Craig... 249,016
Lamp, electric, L. Daft... 249,019
Lamp, electric, A. G. Holcombe... 249,047
Lamp, electric, C. E. Long... 249,149
Lantern, T. B. Osborne... 248,878
Lath, metallic, P. Caduc... 248,911
Liniment, J. W. McFarland... 249,069
Lock. See Nut and bolt lock. Nut lock. Padlock.
Locomotive, tram car, J. Hall... 248,857
Lounge, S. L. Crosgrave... 248,919
Lounge, J. Lowth... 248,868
Lubricator, J. Graham... 248,927
Magneto-electric machines, armature for, C. E. Long... 249,148
Mandrel, expanding, H. Cottrell... 249,143
Marker for slashers, cut, O. M. Rolfe... 249,098
Match safe, W. Trotter, Jr... 248,898
Meat hanger, J. L. White... 249,131
Metallic articles, apparatus for ornamenting hollow, L. S. White... 249,132
Meter. See Water meter.
Middlings purifier, C. G. Rollins... 248,885
Middlings purifiers, etc., feed governor for, S. Potts... 248,879
Milk cooler, W. M. Haney... 249,041
Milk cooler, J. Wilhelm, Jr... 248,903
Mill. See Coffee and spice mill. Grinding mill. Stamp mill. Windmill.
Mining drill, rotary, G. D. Whitcomb... 249,130
Mosquito bar frame, W. T. Bostick... 248,910
Mowing machine, E. Terry... 249,116
Musical instrument, mechanical, J. McTammany, Jr... 248,943
Musical instrument, piston valve, C. G. Conn... 249,012
Net, fly, J. F. Smiths... 249,112
Nut and bolt lock, Darby & Slater... 248,921
Nut lock, Garrard & Hill... 249,034
Nut lock, J. E. Wootten... 248,975
Oil can, self-measuring, T. Scantlin... 248,956
Oil cup holder, G. M. Pratt... 249,091
Paddle, crank, T. F. Odell... 248,945
Padlock, seal, A. M. Adams... 248,835
Pamphlet cover roller, E. L. Miller... 249,074
Pinch bar, G. E. Marvine... 248,941
Pipes and fittings, joining steam, gas, and water, A. N. Winner... 248,974
Pipes, bell joint for coupling, H. G. Dennis... 249,025
Pitman bar, G. P. Conant... 249,011
Planing and grooving machine, J. R. Thomas... 248,962
Planter, seed, Hall & Jacobsen... 248,928
Plow, I. V. Newsom... 249,079
Plow, planting, T. Pates... 249,082
Plow, sulky, E. B. Daniels... 249,020
Power. See Horse power.
Pressure regulator, A. Pope... 249,088
Printing and embossing machine, J. Comly... 248,848
Printing machines, delivery apparatus for, W. Scott... 248,888
Pump, J. A. Whitman... 248,902
Pump, air, E. T. Pettit... 249,085
Pump, chain, J. A. Churchill... 249,005
Pump, force, H. H. Hunter... 249,054
Purifier. See Middlings purifier.
Quoit, parlor, S. P. Wetherill... 248,901
Railway brakes, pipe coupling for pneumatic, G. Westinghouse, Jr... 249,128
Railway safety gate, C. S. & W. H. Riggin... 248,953
Railway switch, J. Brahn... 248,990
Railway tracks, system of, A. M. Billings... 248,840
Reaping machine, J. Harris... 248,929
Regulator. See Pressure regulator.
Rein holder, F. J. Lowe... 248,939
Roaster. See Coffee roaster.
Roasting furnace, J. Campbell... 248,912
Rock drill, J. E. Booth... 248,989
Rock drill, steam, L. B. Stone... 248,896
Rock drills, tripod for, L. B. Stone... 248,895
Rocking chair, J. W. Court... 249,014
Roller. See Pamphlet cover roller.
Routing machine, R. T. White... 249,133
Rubber compounds, anti-slipping material from, C. A. Maxfield... 248,869
Rule, slide, E. Thacher... 249,117
Saddle bar, Dancer & Chappell... 248,920
Safety hook, H. F. Smith... 248,957
Sash fastener, W. McArthur... 248,942
Sausage filler, W. G. Bell... 248,838
Saw, S. Toles... 249,119
Saw arbor, Thomas & Cordesman, Jr... 248,963
Saw mill log carriages, brake for, F. Tuxworth (r)... 9,916
Saw set, J. Burkhart... 248,997
Scaffold trestle, Reyburn & Sweetland... 249,095
Scale, cart, Murphy & Lynett... 249,078
Scale platforms, steadying device for, W. W. Hopkins... 248,863
Scraper, R. O. Bingham... 248,988
Screen. See Window screen.
Screw driver, H. A. Sawtell... 249,101
Screw moulding apparatus, H. Binns... 249,140
Seat. See Car seat.
Separator. See Grain separator. Starch separator.
Sewing cushion and table and cushion combined, S. M. Rhone... 248,951
Sewing heavy materials, method of and machinery for, E. H. Smith... 248,892
Sewing machine trimming mechanism, Allen & Walmsley... 248,977
Shave, H. P. Roberts... 249,097
Shears. See Animal shears.
Shears for cutting flat and round metal, C. Burdick... 248,996
Sheet metal vessels, die for flanging, J. D. Hass... 249,042
Sheller. See Corn sheller.
Shirt, L. Lemos... 249,062
Show case, portable, W. Bourke... 248,842
Show window, safety, W. H. Rushforth... 249,099
Shower bath, portable, J. M. Fultz... 249,145
Shutter fastener, T. S. Pike... 249,087
Sieves, etc., combination mark and cover for, W. B. Melish... 248,870
Skylight, metallic, G. Hayes... 248,858
Sled, G. Nye... 249,081
Soda water and other beverages, apparatus for drawing, W. P. Clark... 248,918
Soda water apparatus and tumbler washer, combined, W. P. Clark... 248,917
Soldering iron, J. & T. H. Hughes... 249,051
Sower, seed, Kenny & Niemann... 248,932
Spindle. See Spinning machine spindle.
Spinning machine spindle, C. H. Chapman... 249,142
Spring. See Glove, etc., spring. Wagon spring.
Stalk cutter, J. N. Pervier... 249,083
Stamp battery ore feeder, E. Coleman... 249,010
Stamp mill, J. M. McFarland... 249,068
Stanchion, J. E. Dean... 249,023
Stand. See Washstand.
Starch, or starch sugar and sirup, and apparatus therefore, treating grain for the production of, Williams & Alberger... 248,973
Starch separator, T. A. Jebb... 249,056
Station, indicator, H. Ganss... 249,033
Steam trap, E. F. Osborne... 248,877
Stool, M. H. Wilson... 249,135
Stopper. See Bottle stopper. Cask stopper.
Store service appliance, J. C. White... 248,968
Stove, cooking, H. C. Hunt... 249,053
Stove grate, C. O. Westland... 249,129
Stove, oil, H. S. Goffe... 249,037
Stove or heater, gas, A. W. Morton... 248,875
Stovepipe thimble, T. Schafer... 249,103
Strainer, lemonade, W. Bower... 248,843
Strainers, cap for covering sink, J. Carpenter... 249,001
Supporter. See Collar supporter.
Suspenders, J. A. Adamson... 249,976
Suspenders, T. O. Potter... 249,089
Suspenders, J. J. Upham... 248,899
Switch. See Railway switch.
Table. See Adjustable table. Game table.
Tablet, blotter, C. E. Meade... 249,071
Tank. See Water tank.
Telegraph conductors, underground conduit for, S. E. Codding... 249,008
Telegraph, quadruplex, H. C. Nicholson... 249,080
Telephone, E. Berliner... 248,839
Telephone exchange, G. W. Coy... 249,015
Telephone receiver, R. M. Lockwood... 249,064
Telescopes, solar screen attachment to, Davis & Berger... 249,022
Thrashing machines, mechanism for operating fan doors of, Z. Macomber... 249,065
Toy, C. S. Hunt... 249,052
Toy chime hoop, J. L. M. Du Four... 249,030
Toy windwheels, device for imparting motion to, H. F. W. Liebmann... 249,146
Trap. See Steam trap. Water trap.
Trimmer. See Finger nail trimmer.
Trunk, F. Protzen... 249,092
Tubes for gas and other purposes, composition for coating flexible, W. Bourgignon... 248,841
Type writer, A. G. Shannon... 248,890
Valve. See Water closet valve.
Valve, balanced slide, E. S. Hildebrandt... 249,045
Valve, steam actuated, W. C. Heister... 248,859
Valve, steam actuated piston, S. G. Bryer... 248,994
Vegetable and meat slicing machine, Anderson & Groff... 249,139
Vehicles, opening and shutting the doors of running, J. D O'Donnell... 248,876
Velocipede, E. Barstow... 248,998
Velocipede, J. Uster... 249,122
Violin, P. Topham... 249,120
Wagon platform gear, M. W. Stevens... 248,966
Wagon spring, A. C. Fish... 248,926
Washstand and water closet, J. Christiansen... 248,914
Washing machine, R. S. Morse... 248,944
Watch chains, charm for, E. A. Cummings... 249,018
Water, apparatus for elevating and purifying, R. P Zimmerman... 249,138
Water closet valve, automatic, M. Hogan... 248,862
Water meter, piston, W. Wells... 248,966
Water tank, railway, J. J. Ray... 248,584
Water trap, W. J. English... 249,031
Weigher, automatic grain, C. Wais... 249,126
Well boring machine, G. Taylor... 249,115
Wells with cement, digging and lining, W. H. H. Davis... 248,922
Wheat grading machine, S. Potts... 248,880
Wheel. See Car wheel.
Wheelwright machine, Doane & Bugbee... 249,026
Windmill, B. Chamberlain... 249,002
Window cushion, J. C. Lackner... 249,061
Window screen, E. H. Schofield... 249,107
Wire, making copper covered iron or steel, S. Hier... 248,860
Wire twisting mechanism, S. W. Olney... 248,946
Woodworker's clamp, J. L. Pope... 248,949
Wrench, R. N. Cherry... 249,003
Yoke clip, neck, Ryno & Porter... 249,100

DESIGNS.

Bell, sleigh, G. W. Goff... 12,563
Carpet, R. P. Hemming... 12,558
Carpet, D. McNair... 12,556
Clock stand, H. J. Davies... 12,562
Fork and spoon, H. W. Hayden... 12,553, 12,554
Knob, door, R. Christesen... 12,550
Screen for coils of hot water and steam pipes, H. W. Garth... 12,551
Sewing machines, ornamentation of, E. Hähnel... 12,552
Sign, watch, L. S. Grout... 12,564
Tope, font of printing, H. Ihlenburg... 12,559
Type, font of printing, W. W. Jackson... 12,560, 12,561
Type, font of printing, J. Marder... 12,557
Type, printing, J. K. Rogers... 12,565
Wall paper, E. Leissnèr... 12,555

TRADE MARKS.

Baking powder, Newton Brothers & Co... 8,810
Beer, lager, F. Hollender... 8,808
Coffee, Java, Newton Brothers & Co... 8,811
Cotton piece goods, Amory Manufacturing Company... 8,800, 8,801
Flour, W. H. Roberson... 8,805
Hair restorer, E. J. Clarke... 8,814
Horse nails, Putnam Nail Company... 8,802, 8,804
Horseshoe nails, Putnam Nail Company... 8,803
Medicated paper for water closet use, Pond's Extract Company... 8,795
Medicinal preparations, Pond's Extract Co... 8,797, 8,798
Medicine, corn, wart, and bunion, T. Egersdorff... 8,815
Oil made from petroleum, illuminating, Standard Oil Company... 8,799
Petroleum, refined, Charles Pratt & Co... 8,816 to 8,818
Preparation for the cure of burns, wounds, sprains, skin diseases, cuts, and coughs, Austin & Melville... 8,807
Sewing cotton and thread, J. Brook & Bros... 8,812, 8,813
Soap, C. Lipps... 8,793
Soap, E. C. Niedt & Co... 8,794
Soda water apparatus, J. W. Tufts... 8,806
Toilet preparations, Pond's Extract Company... 8,796
Toilet preparation, certain, Lanman & Kemp... 8,809
Whisky, Freiberg & Workum... 8,792

English Patents Issued to Americans.

From October 28 to November 1, 1881, inclusive.

Asbestos, H. W. Johns.
Belt pulley, P. Medart.
Boats, apparatus for lowering, R. N. Earle.
Bottles, drawing liquid from, P. Hathaway.
Cork cutting machine, I. S. Elkins *et al.*
Firearm, Colts Patent Firearm Manuf. Company.
Grinding mill, W. N. Cosgrove *et al.*
Journal bearing, D. A. Hopkins.
Pill machinery, J. A. Whitney.
Spinning frame ring, J. Y. Anthony *et al.*
Spring mattress, E. Hinckley.
Wax paper, manufacture of, W. B. H. Dowse.
Wax, purifying, D. T. Gray.

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AN ELEGANT CHRISTMAS PRESENT FREE
TO EVERY ONE WHO READS THIS ADVERTISEMENT

LIBERAL OFFER BY A RESPONSIBLE HOUSE

THE AMERICAN MANUFACTURING COMPANY,
Manufacturers and Importers. Established 1876.

Well and favorably known in the commercial world, as well as to a large portion of the general public, take advantage of this "Merry Christmas Time" to increase their large and growing list of business acquaintances, by making the GRANDEST and MOST ASTONISHING and LIBERAL OFFER ever made by any house in the world. We offer to EVERY PERSON, rich or poor, large or small, who reads this advertisement, AN ELEGANT CHRISTMAS GIFT ABSOLUTELY FREE. These gifts consist of Sewing Machines, Cabinet Organs, Watches, Solid Gold and Plated Rings, Elegant Gold-plated Sleeve Buttons, Neck Chains, Vest Chains, Ladies' Sets, Coin Silver Plated Tea, Table, and Dessert Spoons, Casters, Butter Dishes, Coin Silver Plated Table Knives, Butter Knives, Sugar Shells, China Tea Sets, Dress Patterns, Shirts, Shawls, Ladies' Lace Ties, Photograph and Autograph Albums, Pocketbooks, Toilet Sets, Vases, Pictures, framed and unframed, Gents' Studs, Fine Nickel-plated Revolvers, Toilet Articles, and hundreds of articles too numerous to mention. REMEMBER, ALL THE ABOVE ARTICLES TO BE POSITIVELY GIVEN AWAY. We are BONA-FIDE MANUFACTURERS of a large proportion of the goods we offer, and the largest manufacturers in our line in the United States. OUR GRAND OFFER is: TO EVERY ONE who will send us a TRIAL ORDER in answer to this advertisement, we will give an ELEGANT GIFT selected from the list given above, ABSOLUTELY FREE, and each person ordering will also receive our MAMMOTH ILLUSTRATED CATALOGUE, describing more than 1000 articles that are sold at lower prices than any other house can quote. LET IT BE UNDERSTOOD that our only object in doing this is to induce you to order from us once, and then JUDGE FOR YOURSELF IF IT IS NOT FOR YOUR ADVANTAGE TO BECOME A PERMANENT CUSTOMER: and bear in mind that you will receive just as ELEGANT AND VALUABLE A GIFT IF YOUR ORDER IS LARGE OR SMALL. Some of these gifts are worth as much as $100, and even the smallest are worth from 25c. to $1, and no matter how small your order may be, YOU WILL CERTAINLY RECEIVE ONE OF THESE GIFTS ABSOLUTELY FREE. OUR MAMMOTH ILLUSTRATED CATALOGUE, describing almost every article a person can need, SENT TO EVERY ONE WHO SENDS A TRIAL ORDER in answer to this advertisement. We give below a small list of goods from which your selection can be made:—

CHRISTMAS BOX No. 1.—Consists of 1 Rubber Ball, 1 Swiss Warbler Bird Call, 1 boy's Pocket Knife, 1 Paint Box of 12 paints and brush, and 50 other pleasing articles. Sent, postpaid, for 29 cents.

CHRISTMAS BOX No. 2.—125 pleasing articles for the little ones. Contains 1 French dressed Doll, 1 set of embossed A B C Blocks, 1 elegant floral Christmas Cross, 20 elegantly colored and lifelike Toy Figures of Animals &c., 1 60-page Autograph Album with handsome covers, 6 imported Chromos, 24 Decalcomanie Pictures, 72 Embossed Transfer Pictures. The above box will be sent by mail, to any address for 43 cents.

CHRISTMAS BOX No. 3.—Contains 1 8-inch Doll, china head and stuffed body, 1 Bell Rattle, 1 Rubber Ball, 1 Jump Rope, 1 set A B C Blocks, 1 set Dominoes, 1 Noah's Ark with Animals, 1 Toy Bank, 1 Toy China Tea Set, 1 Whistle, 12 imported Chromos, 100 Embossed Pictures, 1 imitation Coral Necklace, and 50 other pleasing articles. By mail, postpaid, $1.17.

CHRISTMAS BOX No. 4.—Contains 1 silver-plated Butter-knife, 1 ladies' nickel-trimmed Pocketbook, 1 ladies' Lace Tie, 1 imitation Coral Necklace, 1 set gold-plated Sleeve Buttons, 6 ladies' Lace Collarettes, 1 box French Paper, 24 sheets of Paper and Envelopes, 44 pieces popular Music, full sheet music size, 1 embossed basket of Artificial Flowers, 6 handsome Christmas Cards, 6 imported Chromos, 1 Japanese Stuffed Bird, 100 Transfer Pictures, and 48 Decalcomanie Pictures. Sent, postpaid, for $1.65.

CHRISTMAS BOX No. 5.—Consists of 1 large and elegant Photo Album, 1 elegant Autograph Album, 1 elegant ladies' Pocketbook, 1 solid gold band Ring, 1 ladies' Lace Tie, 6 ladies' Lace Collarettes, 1 coin silver-plated Butter Knife, 1 coin silver-plated Napkin Ring, 1 coin silver-plated Sugar Shell, 1 set of 6 coin silver-plated Tea Spoons, 12 warranted linen Napkins, 12 Japanese Napkins, 12 ladies' colored border Handkerchiefs, 1 Floral Christmas Cross, 1 pair elegant embossed baskets of Artificial Flowers. 12 elegant Christmas cards, and 125 other small and pleasing articles. This elegant and valuable Christmas Box will be sent by registered mail, postpaid, on receipt of $5.45.

CHRISTMAS BOX No. 6, for Smokers.—Consists of 1 briar Pipe, 1 briar Cigar Holder, 1 briar Cigarette Holder, 1 pair gold-plated Sleeve Buttons, 1 black silk Necktie. Sent, postpaid, for 57 cents.

CHRISTMAS BOX No. 7, for Smokers.—Consists of 1 elegant imported German Meerschaum Pipe, in satin-lined case, 1 imp'd Meerschaum Cigarette Holder, 1 gold-plated Watch Chain and Cigar Clipper combined, for clipping the ends of cigars, 3 silk Neckties different patterns, 2 black and 1 fancy of the best quality, and one elegant gold-plated Vest Chain, and pair gold-plated Sleeve Buttons, with appropriate Christmas Card. Sent by mail, postpaid, and registered for $4.90.

CHRISTMAS BOX No. 8.—Consists of 1 ladies' gold and black enamel sliding Pencil, 1 pair gold-plated Sleeve Buttons, 1 elegant pair gold-plated eardrops, 1 solid gold Ring, and 36 other articles including Lace Tie, Lace Collarettes, fine Hosiery, &c. Sent, postpaid, for $2.85.

CHRISTMAS CARDS.—Special attention is called to immense and elegant lines of Christmas, New Year and Birthday Souvenirs, embracing the choicest works of art of the most world-renowned publishers of Europe and America, and offered to our customers in quantities to suit at less than publishers' price by the 1000. All cards sent by mail postpaid. Assortment **A** consists of 6 handsome assorted cards 10 cents. Assortment **B**, 6 cards larger 15 cents. Assortment **C** 12 cards very large and elegant 25 cents. Assortment **D** 20 cards 40 cents. Assortment **E** for dealers, 100 cards assorted to retail for from 3 to 15 cents each, $2.25. Assortment **F** for dealers, 300 cards $6.50. Very elegant cards at from 20 cents to 75 cents each. If you want something simply magnificent, send the amount of money you wish to invest, and you will receive by return mail the finest card your money will buy. Fringe Cards at 15, 25, 30, 40, 50, 60, 80, cents each.

GERMAN EMBOSSED PICTURES for decorating ornaments and making home beautiful. N. B.—in order to induce customers to try our sample packages of pictures we shall pack an elegant coin silver-plated Butter Knife, in each sample package mentioned below absolutely free. Now remember, that in buying these packages of pictures, you get all that is mentioned in the package and the Butter Knife, which would cost at a silver ware store, 75 cents beside. Package **L** 100 assorted pictures 35 cents. Package **M** 300 pictures 55 cents. Package **N** 500 pictures, many of them much larger and finer than in the other packages, $1.00.

REMEMBER that although we offer immense bargains in every one of these Christmas Boxes, that every one ordering will not only get the contents of the Christmas Box, but also a **CANT C FT ABSOLUTELY FREE**, and also our mammoth Illustrated Catalogue of Ladies' and Gents' Underwear, Furnishing Goods, Notions, Housekeeping Goods, Kitchen Furnishing Goods, Fancy Goods, Novelties, etc., by using this catalogue you can save 50 per cent. on next year's purchases.

Cut This Out!

It appears but once but the offer is good FOR ONE YEAR.

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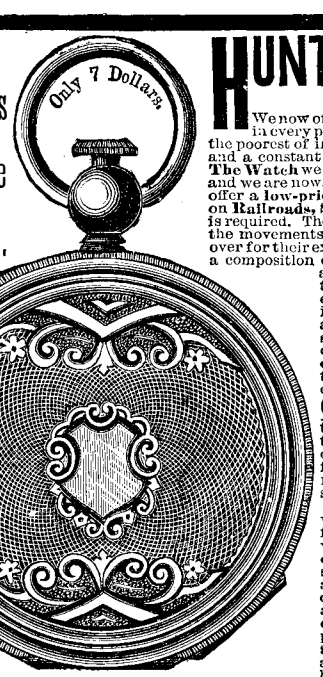

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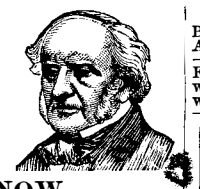

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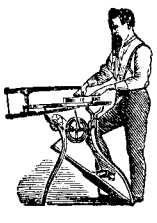

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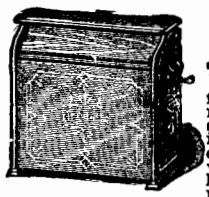

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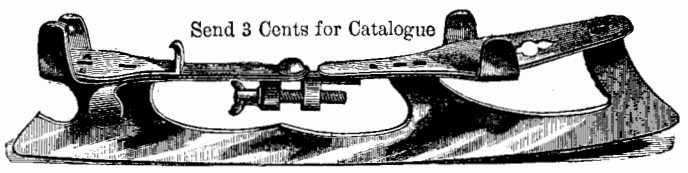

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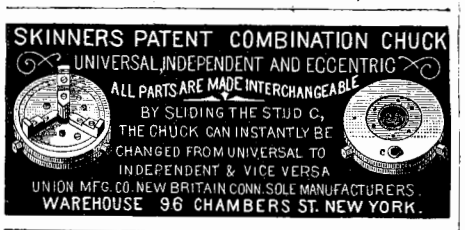
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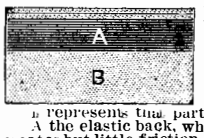

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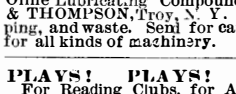
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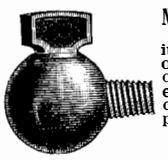

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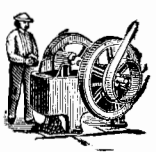

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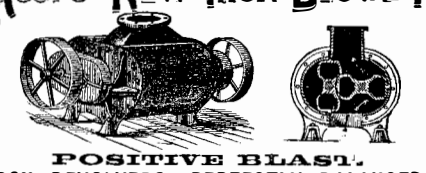

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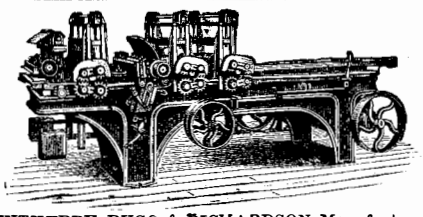

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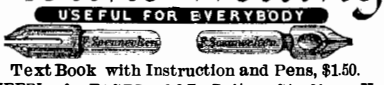

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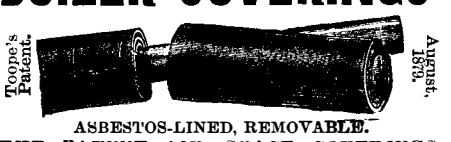

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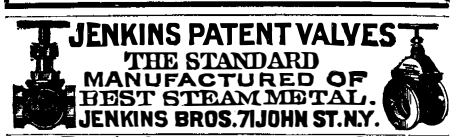

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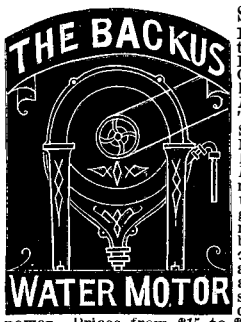

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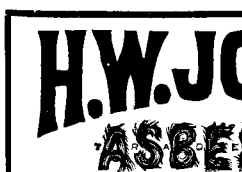

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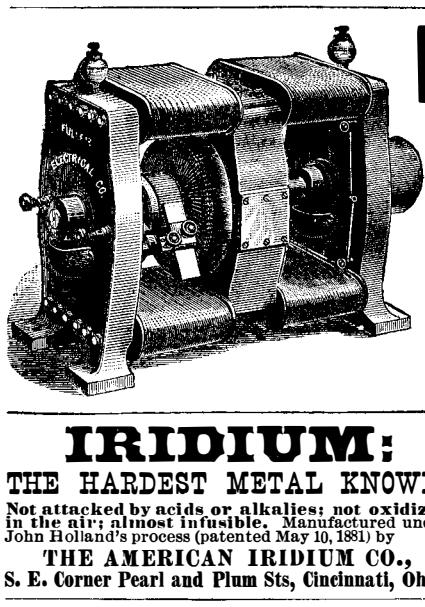

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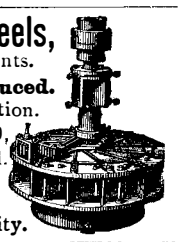

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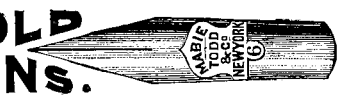

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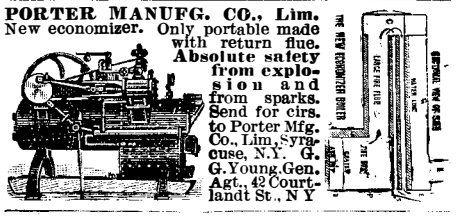

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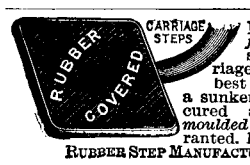

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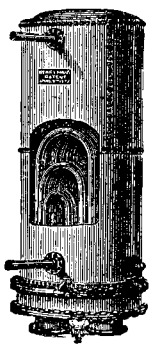

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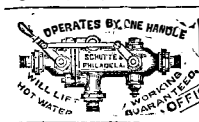

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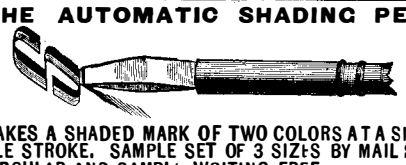

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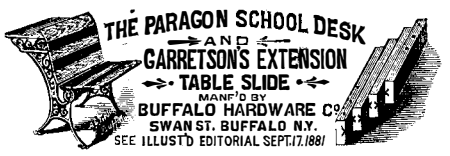

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